THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Unprecedented consumption of pig iron and steel on the threshold of the season always marked by quickened activity, raises the question whether the pace will be kept under control. Pig iron output at a rate of nearly 21,500,000 tons and metal going into melters' hands at something more than that rate, presents a situation in which precedents give little help. The Bessemer steel industry, going forward rapidly again after a marked falling away in 1904, is a large factor in the present movement.

In the past week the foundry industry has been a larger participant in the market than for weeks and the buying of foundry irons has been divided among a diversified and growing list of consumers. There are indications that while foundrymen are getting more business, they are not easily convinced by talk of higher prices for iron. The carrying of larger pig iron stocks at foundries is in evidence, however, and this factor makes it necessary to distinguish between actual consumption and the total obtained by adding blast furnace output to the relatively small monthly decrease in furnace stocks.

The abandonment for the time of the efforts to combine the large Southern companies has scarcely created a ripple in the pig iron market, as prices are sustained by natural conditions. Discussion of advances on Southern irons is answered by continued selling of No. 2 foundry at $13.50 at furnace, and on Northern iron the basis of $16 for No. 2 at Central Western furnace, while aimed at, is not maintained. Southern Ohio iron has sold at $15.75 and in a few instances at $15.50. Increasing production is a factor that is having attention. In the Mahoning and Shenango Valleys the presence of considerable stocks of iron is tempering the somewhat excited feeling in other districts. Pittsburg, Cincinnati and the East report liberal transactions in foundry iron, with signs of a broadening market. A large consumer in the Pittsburg district took 15,000 tons of Northern, Southern and Virginia brands, bringing its recent total up to 25,000 tons. Bessemer iron is less active, after recent buying, but some steel works requirements for March are yet to be met. Basic pig iron at $16 Pittsburg indicates an easier condition than has been generally credited.

The steel market, in billets and in most finished materials, continues to present a record scale of operations. Independent producers of certain of the lighter finished materials are not getting sufficient steel to operate in full, and the prices of their products as established by the larger interests do not warrant importations of billets and sheet bars at present prices abroad. These would mean $29.50 for billets delivered at Pittsburg, or about $27.50 at tidewater.

The most significant fact in the finished material situation is that mills are now falling behind on deliveries in some lines, with the prospect that congested mills will be heard of increasingly in the next six months. Here it is to be remembered that the jobbing trade is largely represented in the business now on the books and that less than three months ago the manufacturers were questioning whether jobbers and actual consumers had not contracted for more material than they could take out in the time specified.

The past week has made no large additions to rail business, but in structural lines the developments have been encouraging. At New York 23,000 tons of new erection in manufacturing lines is up for estimate, and a good tonnage was put on the American Bridge Co.'s books. The plate mills are in a strong position. Of about 83,000 cars estimated to be now under contract. 21,000 are to be all steel, representing 200,000 tons of plates and shapes. The contract for the Pittsburg water works filtration plant has been let, calling for 15,000 tons of iron and steel, including riveted pipe. The steel bar trade is of astonishing proportions. Specifications are heavy and new business has been good, in spite of the fact that large contracts were closed in anticipation of the recent advance.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, March 8.

With no abatement in demand, the iron and steel market shows greater strength from week to week. In practically all of the finished lines the active buying movement which prevailed throughout the first two months of the year has continued through the first week of this month, and with the advent of milder weather the mills are anticipating the placing of still greater tonnage than in either January or February. While the movement of finished material out of the mills is unusually heavy it is not sufficient to supply the demand, and deliveries are gradually falling behind in all classes of material. The shipment of billets and bars to independent finishing mills is considerably below their requirements, and as no immediate increase in steel production is possible, it would seem that despite the efforts of the steel producers, another import movement can hardly be avoided if demand continued as in the past three months.

Westinghouse interests figured as the largest buyers of pig iron in this market this week, covering requirements through the third quarter. Three of these companies purchased approximately 15,000 tons of Northern, Southern and Virginia iron. While most of the Northern foundry was placed on the basis of $16, furnace for No. 2, on a part of the tonnage this price was shaded 15 cents a ton. The Southern iron was placed on a basis of $13.50, Birmingham for No. 2, while the Virginia iron was purchased at $14.50, furnace, al-

though since this contract was closed the Virginia furnaces have advanced prices to $14.75, equal to $17.30, Pittsburg. With the buying by one of these companies last week, the recent purchases of the Westinghouse interests amount to about 25,000 tons. We also note the sale of 2,000 tons of Northern basic at $15.15, Valley furnace, or $16, Pittsburg. Despite heavy recent purchases of iron in the Valleys the market there is still inclined to be weak, the basic transaction referred to bringing out a surprisingly low price, while the efforts of the foundry iron producers to maintain a minimum of $16 at furnace has not been very successful. These concessions are no doubt due to the accumulated stocks at merchant Valley furnaces, while one independent steel interest is carrying 50,000 to 60,000 tons of Bessemer iron. This stock has been reduced from a considerably greater tonnage, as attractive prices have been offered from time to time. Practically all of the accumulated stocks at Western Pennsylvania furnaces have been disposed of, and not until the Valley stocks are cleaned up will the market be placed on a firmer basis. The buying of iron on the part of the foundry trade in this district is more general, small orders being numerous.

Bids were received today for a filtration plant for the Pittsburg water works. In the erection of the plant and laying of pipes close to 15,000 tons of iron and steel will be required. The specifications call for close to 7,000 tons of riveted pipe and 1,600 tons of cast iron pipe and fittings. In addition a considerable tonnage of concrete bars will be required as well as of structural material.

The accumulation of car orders thus far this year has been tremendous. The car plants of the country now have orders on their books for approximately 83,000 cars of various types of which about 21,000 are all steel cars. Bids are also out for about 15,000 additional which it is believed will be placed shortly.

Pig Iron.—Of all the great producing centers in the country, the Valley iron market shows the greatest weakness, and this despite the heavy purchases of iron by the Steel Corporation, Cambria Steel Co., Jones & Laughlin Steel Co., and the Lackawanna Steel Co. The stocks at some of the merchant furnaces are acting as a drag on the market and until this surplus iron is disposed of a firmer tone can hardly be looked for. On the iron placed with Valley furnaces by the Westinghouse interests in the past week there was little difficulty in shading $16 at furnace on No. 2, although $16 was paid for particular brands. Virginia furnaces have advanced prices 25 cents a ton and are holding at $14.75 furnace, while some Southern producers are asking $13.75, furnace. Basic and forge iron are held at $15.15, Valley furnace, and it is possible that this price could be shaded on a desirable tonnage of mill iron. While some producers are asking $15.75 for Bessemer, $15.50 can be done. We revise quotations as follows:

Bessemer, Valley	$15 40 to 15 50
Bessemer, Pittsburg	16 25 to 16 35
No. 1 Foundry	17 00 to 17 25
No. 2 Foundry	16 60 to 16 85
Gray forge, Pittsburg	15 75 to 15 85
Basic, Valley	15 15 to 15 25
Basic, Pittsburg	16 00 to 16 10

Steel.—Shipments of steel from local mills continue to fall below the requirements of consumers, and prompt billets and bars are growing scarcer. Bessemer and open hearth billets for prompt shipment are held at $24.50 to $25, Pittsburg, while sheet bars are held at $26 to $26.50. Open hearth rods are quoted at $32.50 and Bessemer rods at $32.

Ferro-Manganese.—The market is quiet and domestic ferro, 80 percent, is quoted at $44.50 to $45, delivered at buyer's mill, any point east of the Mississippi.

Muck Bar.—The market is quiet and we quote neutral bars at $28.50 to $29, Pittsburg.

Skelp.—Shipments of skelp from all the mills is exceedingly heavy, but little new business is being placed. We quote grooved steel at 1.55c to 1.60c, and sheared at 1.65c to 1.70c. Grooved iron is held at 1.75c to 1.80c, and sheared at 1.80c to 1.85c.

Rails and Track Material.—There is a little better demand for light rails, but prices show no improvement. Most of the rerolling mills are idle, but the mills of the steel producers continue active. We make the following quotations: Fifty lb. and over 500 tons, $28; car lots and less than 500 tons, $30; less than car lots, $32; light rails, 16 lb., $26 to $26.50; 20 lb., $24.50 to $25; 25 to 45 lb., $22.50 to $23. Angle bars, 1.25c; spikes, 1.75c to 1.80c.

Plates.—Close to 7,000 tons of plates will be needed for the steel riveted pipe for the Pittsburg filtration plant, while the 21,000 steel car orders on the books of the car builders will require 200,000 tons. The demand for plates in practically all lines is showing considerable improvement, and with steel car works requirements the plate mills are very comfortably fixed on future tonnage. We quote as follows: Tank plates, 1¼ in. thick, 6¼ in. to 14 in., inclusive, 1.50c f. o. b. mill Pittsburg; over 14 in. up to 100 in., 1.60c. Extras are as follows per lb.: Flange and boiler steel, 10c; marine, A. B. M. A., and ordinary fire box, 20c; still bottom, 30c; locomotive firebox, 50c; plates over 100 in. up to 110 in. in width, not less than 5c per 100 lb. extra; plates 110 in. to 115 in. wide, not less than 10c extra; 115 to 120 in., 15c extra; plates 120 in. to 125 in. wide, not less than 25c extra; plates 125 in. to 130 in. not less than 50c extra; plates 130 in. wide, not less than $1 extra; plates 3-16 in. thick, $2 extra; gauges 7 and 8, $3 extra; No. 9, $5 extra. Five cents extra for less than carloads. Terms net cash in 30 days, and for all points of delivery in the United States except Pacific Coast.

Bars.—Unfilled steel bar tonnage is tremendous and specifications are unusually heavy. On some sizes mills are two months behind and the daily tonnage that is booked is much beyond shipments. One local interest is in the market for 3,000 tons of bar iron and it is probable that the order will be placed this week. A meeting of the hoop manufacturers will be held in a few days for the purpose of advancing prices which are too low in comparison with the present prices on bars and bands. Cotton tie prices will also be announced in a few days. We make the following quotations: Bar iron, 1.65c to 1.60¼c Pittsburg; hoops, 1.55c and bands, 1.50c, both taking bar extras. Bessemer steel bars, 1.50c; open-hearth steel bars, 1.50c; plow and cultivator beams, 1.50c, net; channels, angles, zees and tees, under 3 in., 1.65c. The following differentials are maintained on steel: Less than 2,000 lb. of a size and not less than 1,000 lb., 10 cents advance; less than 1,000 lb. of a size, 30 cents advance.

Structural Material.—Considerable business is under consideration and while the local mills haven't the tonnage in this line in proportion with that booked in other lines, the volume is satisfactory and the outlook exceedingly bright. We quote: Beams and channels up to 15 in., 1.60c; over 15 in., 1.70c; angles 3 x 2 up to 6 x 6, 1.60c; zees, 1.50c; tees, 1.65c; angles from 3 to 16 in., 1.60c; universal and sheared plates, 6¼ to 14 in., inclusive, 1.50c; over 14 in., 1.60c base.

Sheets.—The sheet market continues very strong and independent mills are still inclined to book for only 60-day requirements owing to the uncertainty of the sheet bar market. While an advance in black sheets is expected daily none has yet been made. We quote black sheets in carloads as follows: No. 30, 2.70c; No. 29, 2.60c; No. 28, 2.30c; No. 27, 2.20c; Nos. 25-26, 2.15c; Nos. 23-24, 2.10c; Nos. 18-20, 2.05c; No. 16, 2c; Nos. 12-14, 1.95c; No. 9, 1.90c; No. 8, 1.85c. Galvanized, No. 30, 4.35c; No. 29, 3.85c; No. 28, 3.45c; No. 27, 3.25c; Nos. 25-26, 3.05c; Nos. 23-24, 2.85c; Nos. 18-20, 2.70c; No. 16, 2.55c.

Pipes and Tubes.—The movement of merchant pipe continues heavy, although much new work in line pipe and casing has been held up owing to the agitation against the Standard Oil Co. Discounts to consumers, carload lots, f. o. b.

Pittsburg, plus freight to destination according to Tube Rate Book, are revised as follows:

MERCHANT PIPE.

	Steel. Black.	Steel. Galv.	Iron. Black.	Iron. Galv.
⅛ and ¼ inch	67½	51½	65½	49½
⅜ to 6 inches	70½	65½	74	64
7 and ½ inch	71½	59½	69½	57½
7 to 12 inches	70½	55½	68	53½
Extra Strong Plain Ends.				
⅛ to ⅜ inch	60½	48½	58½	46½
½ to 4 inches	67½	55½	65½	53½
4½ to 8 inches	63½	51½	61½	49½
Double extra strong plain ends, ½ to 8 inches	57	46	55	44

MERCHANT BOILER TUBES, CARLOADS, 22 FEET AND UNDER.

	Steel.	Iron.
1 to 1½ inches	46	42
1¾ to 2½ inches	58	43
2½ inches	60	48
2¾ to 5 inches	66	55
6 to 13 inches	58	43

Less than carloads 2 points less.

Wire and Wire Nails.—The spring movement of wire products has already begun and promises to be unusually heavy before the end of the month. Prices remain unchanged as follows: Wire nails, jobbers' carload lots, $1.80; retailers' carload lots, $1.85, and less than carloads, $1.95; painted barb wire, $1.95 for jobbers in carloads; retailers' carloads, $2, and less than carloads, $2.10, with 30 cents for galvanizing. Annealed smooth fence wire is held at $1.65, with the usual differentials to retailers for carloads and less than carloads. Quotations are all f. o. b. Pittsburg, 60 days, with 2 percent discount for cash in ten days. Iron cut nails are held at $1.85 Pittsburg, and steel at $1.75.

Merchant Steel.—There is no abatement of demand for merchant steel products and the tonnage on the books of local mills is heavier than at any time in the past two years. We quote: Cold rolled and ground shafting, 50 percent off in carload lots, and 45 off in less than car lots, delivered in base territory; tire steel, 1.60c to 1.65c; open-hearth spring steel, 2c to 2.10c; sleigh shoe flat, 1.55c to 1.60c; smooth finished machinery steel, 1.60c; toe calk, 1.05c to 2c.

Old Material.—The old material market is inclined to be quiet and concessions are made on occasional carload lots. However, on large tonnages prices are firm. The seller of Southern low-phosphorus stock is now out of the market, having disposed of all the material the mill had to offer. We make the following quotations, gross tons: Heavy melting stock, $16.25 to $16.75; low phosphorus, $19.50 to $20.50; re-rolling rails, $16 to $16.50; sheet scrap, $14 to $14.25; No. 1 wrought, $19 to $19.50; cast iron borings, $11 to $11.25.

Coke.—Furnace coke for shipment the last half of the year has sold at $2.50 during the week, while foundry is firm at $2.75 to $3, and as high as $3.25 has been paid. The production of the upper region during the week ending Feb. 25 aggregated 255,879 tons, while the lower region produced 76,554 tons.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1164 MONADNOCK BLOCK, March 7.

There is noteworthy activity in all branches of the market. Every indication points to a year of new records in iron and steel consumption. Demand for all materials is to the full capacity of mills. Some producers are embarrassed by specifications. It is next to impossible to get deliveries of plates from the South Chicago mill within six weeks to two months from the date of placing orders. Manufacturers of agricultural shapes are sold for the balance of the season, while on steel bars a leading producer has greatly oversold its capacity for the first half of the year. Jobbers in structural steel are complaining that mills cannot furnish them with material on their contracts in proportion to the volume at which they are shipping it from their stocks, and a local shortage is feared unless mill shipments greatly increase. Billets, wire rods and sheet bars are extremely scarce, and producers are conserving their stock for their own consumption. Rails and track supplies continue in active demand, the local producer having booked orders in February for over 100,000 tons of the former. The tonnage on its books now exceeds the half-million mark, and at the present rate of buying it expects to be soon sold up for the year.

Bar iron has been the only weak product on the list, though it has stiffened somewhat since the $2 advance in steel bars. Scrap is without change and prices remain weak. Pig iron has held the improvement that was noted in our last report. Inquiry is heavy and the prospect of an early advance in both Northern and Southern grades is now more probable. Manufacturers of wire products, who are restricting orders to 60-day shipments, have no difficulty in keeping sold up to their fullest capacity. Tubular goods are also active, the slightly advanced prices on merchant pipe having been well sustained. A marked improvement is apparent in the demand for boiler tubes, which for several weeks past has been of light proportions.

Pig Iron.—Little change if any is to be observed in the local situation from that reported a week ago. No advance in price has taken place, though talk of one is more general. The market is exceptionally strong and several of the smaller Southern producers have withdrawn all quotations. There has been considerable iron sold in the week under review on the basis of $13.50 Birmingham, some of it for delivery in the last half of the year, though the disposition of the majority of sellers is to confine the bulk of the sales recorded to deliveries in the second quarter. There have been sales in recent weeks at $14 Birmingham for No. 2 for second and third quarter deliveries, but the tonnage has been small and is not to be taken as representative of the market. Northern producers are holding their product strongly at $17.50 Chicago, and taking business at these figures for any delivery this year. Demand has been of good proportions, both the foundry and malleable trade buying liberally. We have no change to make in prices this week and quote as follows:

Lake Superior Charcoal	$18 50 to 19 00
Northern Foundry No. 1	18 00
Northern Foundry No. 2	17 50
Northern Foundry No. 3	17 00
Northern Scotch Foundry	18 50
Ohio Strong Softeners No. 1	19 80 to 19 80
Ohio Strong Softeners No. 2	18 80 to 18 80
Southern Foundry No. 1	17 65 to 18 15
Southern Foundry No. 2	17 15 to 17 65
Southern Foundry No. 3	16 65 to 17 15
Southern Foundry No. 4	16 40 to 16 90
Southern No. 1 Soft	17 65 to 18 15
Southern No. 2 Soft	17 15 to 17 90
Southern Gray Forge	16 40
Southern Mottled	16 40
Southern Silveries (4% to 6% Silicon)	18 65 to 19 15
Jackson Co. Silveries (6% to 8% Silicon)	21 80 to 22 80
Jackson Co. Silveries (8% to 10% Silicon)	23 80 to 24 80
Alabama and Georgia Car Wheel	21 15
Malleable Bessemer	17 50
Basic Iron	17 65 to 18 15

Billets.—A few small orders have been placed with local sellers for forging billets in the week, but generally speaking the market is quiet. All intermediate rolled products are very scarce, and any order that is taken is largely as a courtesy on the part of the seller. Our prices are without change, though subject to the premiums that may be asked. We quote forging billets, 4 x 4 and larger, up to but not including 10 x 10, up to .25 carbon, $28; up to and including .60 carbon, $1 extra. Rerolling billets, Bessemer or open-hearth, 4 x 4 and larger, $27 and upwards; billets, 3⅞-in. and smaller and sheet and tin bars, $28 and upwards, according to the tonnage and delivery. Wire rods are scarce and are quoted at $33 Pittsburg.

Bars.—The demand for steel bars has fallen to a minimum since the establishment of the new schedule. Most of the Western consumers covered for their requirements up to July next while the old prices were in vogue, some having been permitted to contract as far ahead as Jan. 1, 1905, on the basis of 1.40c Pittsburg. Bar iron is quiet and the market is soft. While some local interests are asking 1.65c Chicago, this can

be shaded $1 a ton. We quote carload lots, mill shipments, Chicago delivery, as follows: Bar iron, 1.60c to 1.65c; Bessemer and open hearth bars and bands, 1.66½c base, half extras; soft steel angles, less than 3 x 3, 1.76½c; hard steel angles rolled from old rails, 1.60c to 1.65c; hoops, 1.71½c base, full extras. Store quotations are firm, and we quote on lots from warehouse stocks as follows: Bar iron, 1.90c to 2c base, full extras; soft steel bars and bands, 1.85c to 1.95c base, full extras; soft steel angles, channels and tees, 1.95c to 2.05c; hoops, 2c to 2.10c base, full extras.

Sheets.—The demand for both black and galvanized sheets continues of good proportions. In the case of box annealed, the market has so much improved as to warrant an advance of $2 a ton, according to the opinions of several large sellers. Jobbers report the movement from stocks as being very active, especially to the galvanized and tin plate trade. We quote prices for Chicago delivery, mill shipments, carload lots, as follows: Blue annealed sheets, Nos. 9 to 10, 1.81½c to 1.86½c; Nos. 11 and 12, 1.86½c to 1.91½c; Nos. 13 and 14, 1.91c to 1.96½c; Nos. 15 and 16, 2.01½c to 2.06½c. On box annealed, one pass, cold rolled, we quote Nos. 18 and 20, 2.21½c to 2.26½c; Nos. 22 and 24, 2.26½c to 2.31½c; Nos. 25 and 26, 2.31½c to 2.36½c; No. 7, 2.36½c to 2.41½c; No. 28, 2.46½c to 2.51½c; No. 29, 2.56½c to 2.61½c; No. 30, 2.66½c to 2.71½c. We quote on lots from warehouse stocks as follows: No. 10, 2.05c to 2.10c; No. 12, 2.10c to 2.15c; No. 14, 2.15c to 2.20c; No. 16, 2.25c to 2.30c; Nos. 18 and 20, 2.40c to 2.45c; Nos. 22 and 24, 2.45c to 2.50c; No. 26, 2.60c to 2.65c; No. 27, 2.70c to 2.75c; No. 28, 2.80c to 2.85c; No. 29, 2.90c to 2.95c. Galvanized sheets, mill shipments, Chicago delivery, are quoted as follows: Nos. 12-14, 2.56½c; No. 16, 2.71½c; Nos. 18-21, 2.86½; Nos. 22-24, 3.01½c; No. 26, 3.21½c; No. 27, 3.41½c; No. 28, 3.61½c; No. 29, 3.86½c. Jobbers' prices on lots from store have also been revised, and are now as follows: Nos. 10 to 14 inclusive, 3.10c; No. 16, 3c; Nos. 18-20, 3.10c; Nos. 22-24, 3.25c; No. 26, 3.50c; No. 27, 3.70c; No. 28, 3.95c; No. 29, 4.40c; No. 30, 4.85c.

Structural Steel.—Mills report that specifications from jobbers, structural fabricators, bridge and car builders are numerous and of an aggregate tonnage that is very large. All are stocking up heavily for the spring and summer trade and are pressing mills actively for quicker shipments. Local stocks are being reduced faster than they can be replenished, and a scarcity is feared unless mills take more energetic measures in filling their contracts. Prices are without change, and we quote carload lots, mill shipments, Chicago delivery, as follows: Beams and channels, 3 to 15 in. inclusive, 1.76½c; angles, 3 to 6 in., ¼ in. and heavier, 1.76½c; angles larger than 6 in. on one or both legs, 1.86½c; beams larger than 15 in., 1.86½c; zees, 3 in. and over, 1.76½c; tees, 3 in. and over, 1.86½c; with the usual extras for cutting to exact lengths, punching, coping, bending or other shop work. We quote the new prices from store as follows: 2c to 2.10c for angles, beams and channels, base sizes, with 2.10c to 2.20c for 18, 20 and 24-in. beams; tees and zees, 2.05c to 2.15c. These prices are for either random lengths or cut to specifications in excess of 5 ft.

Plates.—Demand continues of the same heavy proportions as for several weeks past. The leading Western interest is unable to keep pace with its orders and specifications, and at least six weeks are required in which to give delivery. Store trade is also active. We quote carload lots, mill shipments, Chicago delivery, as follows: Tank steel, ¼ in. and heavier, 6¼ in. to 14 in. wide, rectangular plates only, 1.66½c; over 14 in. to 100 in., 1.76½c base; flange steel, 1.86½c base; marine steel, 1.96½c base, all full extras. Plates, 3-16 in. thick, $2 extra; gauges, 7 to 8, $3 extra; No. 9, $5 extra. Less than carload lots, $5 extra. Store prices have also been advanced. Revised quotations are as follows: Tank steel, ¼ in. and heavier, up to and including 72 in. wide, 2c; over 72 in. wide up to 100 in., 2.10c; over 100 in. wide, usual mill extras; 3-16 in. up to but not including 72 in. wide, 2.10c; 3-16 in., 72 in. with, 2.35c; flange steel, 25c extra; heads, 25c extra.

Rails and Track Supplies.—During February, the South Chicago mill booked orders for over 100,000 tons of standard sections. This mill has now approximately 500,000 tons on its books for delivery this year. Considerable tonnage is still pending, and new business is being added every day. Light rails continue rather quiet, though prices remain firm. Track supplies are in active demand, the entire output of Western manufacturers going into immediate consumption. We quote heavy sections in 500-ton lots and over, f. o. b. mill, $28; less than 500 tons to carload lots, $30; less than carload lots, $32. Light rails are as follows: 12-lb. sections, $27; 16-lb., $26; 20 and 25-lb., $25; 30, 35, 40 and 45-lb. sections, $24, all f. o. b. Milwaukee mill. Track supplies, f. o. b. Joliet mill: Angle bars, 1.40c to 1.50c; spikes, first quality, 1.70c to 1.75c; track bolts, 3¼ x ¾, with square nuts, 2.40c to 2.50c per lb., with hexagon nuts, 2.55c to 2.65c.

Merchant Steel.—The situation is as it has been for some time—mills sold up for several months ahead and declining to take on new tonnage. Specifications are heavy. We quote carload lots, mill shipments, Chicago delivery, as follows: Spring steel, 2.10c; sleight shoe, flat sizes, 1.71½c; concave and convex, 1.86½c; cutter shoe, 2.35c; smooth finished machinery steel, 1.91½c; smooth finished tire, 1.86½c; plow steel, 2.20c and upwards, according to quality; toe calk steel, 2.21½c. Cold rolled shafting, 50 percent off in carload lots and 45 percent in less than carload lots. Crucible tool steel, 6½c to 8c; special grades of tool steel, 13c and upwards.

Merchant Pipe.—New business and specifications have been of good volume in the week, and the market has a strong appearance. Prices are without change, and we quote carload lots, mill shipments, random lengths, f. o. b. Chicago, as follows:

MERCHANT PIPE.

	Steel.		Iron.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ to ¼ inches	65.85	49.85	63.85	47.85
⅜ to ½ inches	69.85	57.85	67.85	55.85
¼ to 6 inches	73.85	63.85	72.35	62.35
7 to 12 inches	68.85	53.85	67.35	51.85
EXTRA STRONG PIPE.				
⅛ to ⅜ inches	58.85	46.85	56.85	44.85
½ to 4 inches	65.85	53.85	63.85	51.85
4½ to 8 inches	61.85	49.85	59.85	47.85
DOUBLE EXTRA STRONG PIPE.				
½ to 8 inches	54.85	43.85	52.85	41.85

Boiler Tubes.—The demand has greatly improved in the last few weeks, the orders from the boiler and railroad trades being especially good. We quote carload lots, mill shipments, Chicago delivery, as follows:

BOILER TUBES.

	Steel.	Iron.	Seamless.
1 to 1½ inches	42.35	39.35	53.00
1¾ to 2¼ inches	54.35	39.35	40.00
2½ inches	56.35	44.35	43.00
2¾ to 5 inches	62.35	51.35	Up to 4½ inches 50.50
6 to 13 inches	54.35	39.35	.....

Less than carload lots from store, as follows:

	Steel.	Iron	Seamless Steel
1 to 1½ inches, inclusive	40	35	42½
1¾ to 2¼ inches, inclusive	50	35	35
2½ inches, inclusive	52½	35	37½
2¾ to 5 inches, inclusive	60	47½	47½
6 inches and larger	50	35	

Cast Iron Pipe.—A good tonnage has been closed in the week past, and several large bids have been sent out. Prices are very strong and will doubtless be advanced shortly. We quote carload lots, Chicago delivery, as follows: 4-in. water pipe, $28.50; 6-in. and larger, $27.50; gas pipe, $1 a ton higher.

Wire Products.—No diminution is to be noted in the demand for nails, fencing and other wire materials. Both from the agricultural and manufacturing trade, orders are plenteous, mills being taxed to their utmost capacity in filling same within the specified delivery. Prices are very firm, and we quote carload lots to jobbers, Chicago delivery, as follows: Wire

nails, $1.95; painted barb wire, $2.10; galvanized barb wire, $2.40; smooth annealed wire, $1.80; smooth galvanized wire, $2.10; polished staples, $2.05; galvanized staples, $2.35. Less than carload lots to jobbers are 5 cents higher than above prices. The retail trade is quoted 5 cents extra over the foregoing on carload lots, and 10 cents extra on less than carload lots. Bale ties are unchanged at 82½ and 5 percent to 85 percent discount f. o. b. Waukegan, Ill., on straight carload lots. Poultry netting, 85 and 5 percent discount from list f. o. b. Joliet and DeKalb, with actual freight allowed not exceeding 30 cents per 100 lb.

Foundry Coke.—Demand for coke is of fair proportions, being especially good for material on track. Prices are firm on the basis of $3.25 at Connellsville for 72-hour foundry, or $5.90 Chicago in carload lots. Less popular brands of Virginia and West Virginia cokes are selling at from $2.50 to $2.75 at the ovens. Wise County, Virginia, coke at $3 at the ovens, makes the going price here $5.25.

Old Material.—There is no change in the local situation. Not enough demand is in evidence to determine the market in either direction, and both dealers and consumers are resting on their oars as it were, waiting for developments. Prices are weak, though without appreciable change from those of a week ago. We quote as follows:

Old steel rails (4 feet and over)	$15 00 to 15 50
Old steel rails (less than 4 feet)	16 00 to 16 50
Old iron rails	19 50 to 20 00
Relaying rails, subject to inspection	22 00 to 22 50
Relaying rails, without inspection	20 00 to 20 50
Old wheels	16 50 to 17 00
Heavy melting steel	14 50 to 15 00
Mixed country steel	9 50 to 10 50
Low phosphorus scrap (.05 and under)	14 00 to 14 50

The following quotations are for net tons:

No. 1 R. R. wrought	17 00 to 17 50
No. 2 R. R. wrought	16 00 to 16 50
Shafting	17 00 to 17 50
Dealers' forge, No. 1	12 00 to 12 50
Wrought pipe and flues	11 00 to 11 50
No. 1 cast, 150 lbs. and less	13 50 to 14 00
No. 1 mill	11 00 to 11 50
No. 1 Busheling	11 00 to 11 50
No. 2 Busheling	10 50 to 11 00
Country sheet	8 00 to 8 50
No. 1 boilers, cut	11 00 to 11 50
Boiler punchings	13 00 to 13 50
Iron car axles	21 00 to 21 50
Steel car axles	16 50 to 17 00
Iron axle turnings	11 50 to 12 00
Steel axle turnings	11 00 to 11 50
Cast borings	8 25 to 8 75
Mixed borings, etc.	8 25 to 8 75
Machine shop turnings	11 00 to 11 50
Railroad malleable	13 00 to 13 50
Agricultural malleable	12 00 to 13 00
Stove plate and light cast scrap	11 00 to 11 50
Old iron splice bars	18 00 to 18 50

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
BROWNING BUILDING, March 8.

Iron Ore.—Chartering of vessels for the season is now being done at 75 cents from ports at the head of the lakes, 70 cents from Marquette and 60 cents from Escanaba, an advance of 5 cents over last season's carrying charge, and it is expected that before the close of the week a large percentage of the business of the season will be covered by contracts. The new rates are satisfactory to both vesselmen and shippers. All labor questions of importance have been disposed of and everybody connected with lake interests is busy getting ready for the opening of navigation.

Judging from the hesitancy of Eastern furnace men in placing orders for ore, they are not nearly so optimistic as those of the Central West concerning the demand for pig iron during the last half of the current year. It is predicted that, unless there is a decided curtailment of production of pig iron during the second half, many Eastern furnaces will have difficulty in buying enough Lake Superior ores to meet their requirements.

Pig Iron.—Sales of fair tonnages of basic have been made, but at somewhat lower prices, the usual price being $15.25 Valley furnace. The foundry iron market is firmer and $16 for No. 2, Valley furnace, is now the rule. From Cleveland furnaces, iron is delivered in the city at $16.25 to $16.50. Southern is selling in very small quantities at $13.50 to $13.75, Birmingham, for No. 2. We quote as follows, Cleveland delivery:

Bessemer	$16 25 to 16 35
No. 1 Foundry	16 75 to 17 00
No. 2 Foundry	16 25 to 16 50
No. 3 Foundry	15 50 to 15 75
No. 2 Southern	17 35 to 17 60
Gray Forge	15 75 to 16 00
Gray Forge, Southern	15 85 to 16 35
Lake Superior Charcoal	18 00 to 18 50

Finished Material.—The mills are having much difficulty in giving satisfactory delivery. Shipbuilders complain of delay in shipments of plates and the mills are also far behind in the delivery of structural material. There has been very little buying of steel bars since the advance to 1.59½c Cleveland, or 1.50c Pittsburg, was made. The bar iron business is somewhat irregular and does not seem to have been benefited by the advance in steel bars. Western mills are selling at 1.55c at their plants, but in this territory quotations are usually from 1.60c to 1.65c at the mills. There is a fair demand for sheets. The prices of the principal producers through jobbers are as follows: Cleveland delivery, the freight from Pittsburg being 9½ cents: Mill sales of black sheets in carload lots No. 10, 1.84½c; Nos. 11-12, 1.89½c; No. 14, 1.94½c; No. 16, 2.04½c; No. 27, 2.39¼c; No. 28, 2.40¼c. Galvanized, mill sales, No. 14, 2.64½c; No. 16, 2.74½c; Nos. 18-20, 2.89½c; Nos. 22-24, 3.04½c; Nos. 25-26, 3.24½c; No. 27, 3.44 1-3c; No. 28, 3.64½c. Out of stock, black sheets, ¼ in., 1.85c; 3-16 in., 1.95c. Blue annealed, No. 10, 2.05c; No. 12, 2.10c; No. 14, 2.15c; No. 16, 2.25c. One pass cold rolled: Nos. 18-20, 2.45c; Nos. 22-24, 2.50c; No. 26, 2.55c; No. 27, 2.60c; No. 28, 2.70c; No. 30, 3.10c. Galvanized out of stock, No. 16, 2.95c; Nos. 18-20, 3.05c; Nos. 22-24, 3.50c; No. 26, 3.40c; No. 27, 3.60c; No. 28, 3.80c; No. 30c, 4.60c.

Old Material.—The market is extremely dull, but prices are firm and there is some prospect of improved demand. We quote as follows, gross tons, Cleveland:

Old iron rails	$22 00 to 23 50
Old steel rails (over 6 feet)	16 00 to 16 50
Old steel rails (under 6 feet)	16 50 to 17 00
Old car wheels	15 50 to 16 00
Steel boiler plate	13 00 to 13 50
Steel axles	16 50 to 17 00
Malleable iron (railroad)	15 00 to 15 50
Malleable iron (agricultural)	14 00 to 14 50
Heavy steel	16 00 to 16 50

We quote as follows, net tons:

No. 1 R. R. wrought	16 50 to 17 00
No. 1 busheling	14 00 to 14 50
No. 1 machine cast	14 50 to 15 00
Iron axles	19 00 to 20 00
Axle turnings	10 50 to 11 00
Wrought turnings (free from cast)	10 00 to 10 50
Grate bars	10 00 to 10 50
Pipes and flues	13 00 to 14 00
Tank iron	10 50 to 11 00
Hoop and band iron	9 00 to 10 00
Sheet iron	7 00 to 8 00
Wrought drillings	12 00 to 12 50
Stove plate	10 50 to 11 00
Cast borings	8 00 to 8 50

CINCINNATI.

March 7.

Coke.—As coke ovens are now shipping more reliably on contracts there is less inquiry for spot coke for either foundry or furnace use. There is but little inquiry for contract coke and the general market is quiet. Prompt shipment Connellsville is quoted at $3 for foundry grade and $2.50 for furnace. Furnace coke for last half delivery, standard Connellsville brands, is held at $2.25 f. o. b. ovens. For the same delivery foundry coke is quoted at $3 f. o. b. Connellsville.

Pig Iron.—There has been a fair volume of buying the past week and the feeling in the trade is that the Southern iron situation, while not quotably higher, is strong. Sales are reported of 4,000 tons of Southern iron to an Eastern cast iron pipe maker and 9,000 tons to another cast iron pipe company. A lot of 2,000 tons of Ohio iron went to a Michigan concern and 1,000 tons of Virginia iron was sold to an Ohio stove manufacturer. A large melter of Southern iron in Indiana

be shaded $1 a ton. We quote carload lots, mill shipments, Chicago delivery, as follows: Bar iron, 1.60c to 1.65c; Bessemer and open hearth bars and bands, 1.66½c base, half extras; soft steel angles, less than 3 x 3, 1.76½c; hard steel angles rolled from old rails, 1.60c to 1.65c; hoops, 1.71½c base, full extras. Store quotations are firm, and we quote on lots from warehouse stocks as follows: Bar iron, 1.90c to 2c base, full extras; soft steel bars and bands, 1.85c to 1.95c base, full extras; soft steel angles, channels and tees, 1.95c to 2.05c; hoops, 2c to 2.10c base, full extras.

Sheets.—The demand for both black and galvanized sheets continues of good proportions. In the case of box annealed, the market has so much improved as to warrant an advance of $2 a ton, according to the opinions of several large sellers. Jobbers report the movement from stocks as being very active, especially to the galvanized and tin plate trade. We quote prices for Chicago delivery, mill shipments, carload lots, as follows: Blue annealed sheets, Nos. 9 to 10, 1.81½c to 1.86½c; Nos. 11 and 12, 1.86½c to 1.91½c; Nos. 13 and 14, 1.91c to 1.96½c; Nos. 15 and 16, 2.01½c to 2.06½c. On box annealed, one pass, cold rolled, we quote Nos. 18 and 20, 2.21½c to 2.26½c; Nos. 22 and 24, 2.26½c to 2.31½c; Nos. 25 and 26, 2.31½c to 2.36½c; No. 7, 2.36½c to 2.41½c; No. 28, 2.46½c to 2.51½c; No. 29, 2.56½c to 2.61½c; No. 30, 2.66½c to 2.71½c. We quote on lots from warehouse stocks as follows: No. 10, 2.05c to 2.10c; No. 12, 2.10c to 2.15c; No. 14, 2.15c to 2.20c; No. 16, 2.25c to 2.30c; Nos. 18 and 20, 2.40c to 2.45c; Nos. 22 and 24, 2.45c to 2.50c; No. 26, 2.60c to 2.65c; No. 27, 2.70c to 2.75c; No. 28, 2.80c to 2.85c; No. 29, 2.90c to 2.95c. Galvanized sheets, mill shipments, Chicago delivery, are quoted as follows: Nos. 12-14, 2.56½c; No. 16, 2.71½c; Nos. 18-21, 2.86½; Nos. 22-24, 3.01½c; No. 26, 3.21½c; No. 27, 3.41½c; No. 28, 3.61½c; No. 29, 3.86½c. Jobbers' prices on lots from store have also been revised, and are now as follows: Nos. 10 to 14 inclusive, 3.10c; No. 16, 3c; Nos. 18-20, 3.10c; Nos. 22-24, 3.25c; No. 26, 3.50c; No. 27, 3.70c; No. 28, 3.95c; No. 29, 4.40c; No. 30, 4.85c.

Structural Steel.—Mills report that specifications from jobbers, structural fabricators, bridge and car builders are numerous and of an aggregate tonnage that is very large. All are stocking up heavily for the spring and summer trade and are pressing mills actively for quicker shipments. Local stocks are being reduced faster than they can be replenished, and a scarcity is feared unless mills take more energetic measures in filling their contracts. Prices are without change, and we quote carload lots, mill shipments, Chicago delivery, as follows: Beams and channels, 3 to 15 in. inclusive, 1.76½c; angles, 3 to 6 in., ¼ in. and heavier, 1.76½c; angles larger than 6 in. on one or both legs, 1.86½c; beams larger than 15 in., 1.86½c; zees, 3 in. and over, 1.76½c; tees, 3 in. and over, 1.86½c; with the usual extras for cutting to exact lengths, punching, coping, bending or other shop work. We quote the new prices from store as follows: 2c to 2.10c for angles, beams and channels, base sizes, with 2.10c to 2.20c for 18, 20 and 24-in. beams; tees and zees, 2.05c to 2.15c. These prices are for either random lengths or cut to specifications in excess of 5 ft.

Plates.—Demand continues of the same heavy proportions as for several weeks past. The leading Western interest is unable to keep pace with its orders and specifications, and at least six weeks are required in which to give delivery. Store trade is also active. We quote carload lots, mill shipments, Chicago delivery, as follows: Tank steel, ¼ in. and heavier, 6¼ in. to 14 in. wide, rectangular plates only, 1.66½c; over 14 in. to 100 in., 1.76½c base; flange steel, 1.86½c base; marine steel, 1.96½c base, all full extras. Plates, 3-16 in. thick, $2 extra; gauges, 7 to 8, $3 extra; No. 9, $5 extra. Less than carload lots, $5 extra. Store prices have also been advanced. Revised quotations are as follows: Tank steel, ¼ in. and heavier, up to and including 72 in. wide, 2c; over 72 in. wide up to 100 in., 2.10c; over 100 in. wide, usual mill extras; 3-16 in. up to but not including 72 in. wide, 2.10c; 3-16 in., 72 in. with, 2.35c; flange steel, 25c extra; heads, 25c extra.

Rails and Track Supplies.—During February, the South Chicago mill booked orders for over 100,000 tons of standard sections. This mill has now approximately 500,000 tons on its books for delivery this year. Considerable tonnage is still pending, and new business is being added every day. Light rails continue rather quiet, though prices remain firm. Track supplies are in active demand, the entire output of Western manufacturers going into immediate consumption. We quote heavy sections in 500-ton lots and over, f. o. b. mill, $28; less than 500 tons to carload lots, $30; less than carload lots, $32. Light rails are as follows: 12-lb. sections, $27; 16-lb., $26; 20 and 25-lb., $25; 30, 35, 40 and 45-lb. sections, $24, all f. o. b. Milwaukee mill. Track supplies, f. o. b. Joliet mill: Angle bars, 1.40c to 1.50c; spikes, first quality, 1.70c to 1.75c; track bolts, 3¼ x ¾, with square nuts, 2.40c to 2.50c per lb., with hexagon nuts, 2.55c to 2.65c.

Merchant Steel.—The situation is as it has been for some time—mills sold up for several months ahead and declining to take on new tonnage. Specifications are heavy. We quote carload lots, mill shipments, Chicago delivery, as follows: Spring steel, 2.10c; sleight shoe, flat sizes, 1.71½c; concave and convex, 1.86½c; cutter shoe, 2.35c; smooth finished machinery steel, 1.91½c; smooth finished tire, 1.86½c; plow steel, 2.20c and upwards, according to quality; toe calk steel, 2.21½c. Cold rolled shafting, 50 percent off in carload lots and 45 percent in less than carload lots. Crucible tool steel, 6½c to 8c; special grades of tool steel, 13c and upwards.

Merchant Pipe.—New business and specifications have been of good volume in the week, and the market has a strong appearance. Prices are without change, and we quote carload lots, mill shipments, random lengths, f. o. b. Chicago, as follows:

MERCHANT PIPE.

	Steel. Black. Percent.	Steel. Galv. Percent.	Iron. Black. Percent.	Iron. Galv. Percent.
⅛ to ¼ inches	65.85	49.85	63.85	47.85
⅜ to ½ inches	69.85	57.85	67.85	55.85
¼ to 6 inches	73.85	63.85	72.35	62.35
7 to 12 inches	68.85	53.85	67.35	51.85
EXTRA STRONG PIPE.				
⅛ to ¼ inches	58.85	46.85	56.85	44.85
½ to 4 inches	65.85	53.85	63.85	51.85
4½ to 8 inches	61.85	49.85	59.85	47.85
DOUBLE EXTRA STRONG PIPE.				
½ to 8 inches	54.85	43.85	52.85	41.85

Boiler Tubes.—The demand has greatly improved in the last few weeks, the orders from the boiler and railroad trades being especially good. We quote carload lots, mill shipments, Chicago delivery, as follows:

BOILER TUBES.

	Steel.	Iron.	Seamless.
1 to 1½ inches	42.35	39.35	53.00
1¾ to 2¼ inches	54.35	39.35	40.00
2½ inches	56.35	44.35	43.00
2¾ to 5 inches	62.35	51.35	Up to 4½ inches 50.50
6 to 13 inches	54.35	39.35	.....

Less than carload lots from store, as follows:

	Steel.	Iron	Seamless Steel
1 to 1½ inches, inclusive	40	35	42½
1¾ to 2¼ inches, inclusive	50	35	35
2½ inches, inclusive	52½	35	37½
2¾ to 5 inches, inclusive	60	47½	47½
6 inches and larger	50	35	

Cast Iron Pipe.—A good tonnage has been closed in the week past, and several large bids have been sent out. Prices are very strong and will doubtless be advanced shortly. We quote carload lots, Chicago delivery, as follows: 4-in. water pipe, $28.50; 6-in. and larger, $27.50; gas pipe, $1 a ton higher.

Wire Products.—No diminution is to be noted in the demand for nails, fencing and other wire materials. Both from the agricultural and manufacturing trade, orders are plenteous, mills being taxed to their utmost capacity in filling same within the specified delivery. Prices are very firm, and we quote carload lots to jobbers, Chicago delivery, as follows: Wire

nails, $1.95; painted barb wire, $2.10; galvanized barb wire, $2.40; smooth annealed wire, $1.80; smooth galvanized wire, $2.10; polished staples, $2.05; galvanized staples, $2.35. Less than carload lots to jobbers are 5 cents higher than above prices. The retail trade is quoted 5 cents extra over the foregoing on carload lots, and 10 cents extra on less than carload lots. Bale ties are unchanged at 82½ and 5 percent to 85 percent discount f. o. b. Waukegan, Ill., on straight carload lots. Poultry netting, 85 and 5 percent discount from list f. o. b. Joliet and DeKalb, with actual freight allowed not exceeding 30 cents per 100 lb.

Foundry Coke.—Demand for coke is of fair proportions, being especially good for material on track. Prices are firm on the basis of $3.25 at Connellsville for 72-hour foundry, or $5.90 Chicago in carload lots. Less popular brands of Virginia and West Virginia cokes are selling at from $2.50 to $2.75 at the ovens. Wise County, Virginia, coke at $3 at the ovens, makes the going price here $5.25.

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Old steel rails (4 feet and over)	$15 00 to 15 50
Old steel rails (less than 4 feet)	16 00 to 16 50
Old iron rails	19 50 to 20 00
Relaying rails, subject to inspection	22 00 to 22 50
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Old wheels	16 50 to 17 00
Heavy melting steel	14 50 to 15 00
Mixed country steel	9 50 to 10 50
Low phosphorus scrap (.05 and under)	14 00 to 14 50

The following quotations are for net tons:

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No. 2 R. R. wrought	16 00 to 16 50
Shafting	17 00 to 17 50
Dealers' forge, No. 1	12 00 to 12 50
Wrought pipe and flues	11 00 to 11 50
No. 1 cast, 150 lbs. and less	13 50 to 14 00
No. 1 mill	11 00 to 11 50
No. 1 Busheling	11 00 to 11 50
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Stove plate and light cast scrap	11 00 to 11 50
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CLEVELAND.

OFFICE OF *The Iron Trade Review*,
BROWNING BUILDING, March 8.

Iron Ore.—Chartering of vessels for the season is now being done at 75 cents from ports at the head of the lakes, 70 cents from Marquette and 60 cents from Escanaba, an advance of 5 cents over last season's carrying charge, and it is expected that before the close of the week a large percentage of the business of the season will be covered by contracts. The new rates are satisfactory to both vesselmen and shippers. All labor questions of importance have been disposed of and everybody connected with lake interests is busy getting ready for the opening of navigation.

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Pig Iron.—Sales of fair tonnages of basic have been made, but at somewhat lower prices, the usual price being $15.25 Valley furnace. The foundry iron market is firmer and $16 for No. 2, Valley furnace, is now the rule. From Cleveland furnaces, iron is delivered in the city at $16.25 to $16.50. Southern is selling in very small quantities at $13.50 to $13.75, Birmingham, for No. 2. We quote as follows, Cleveland delivery:

Bessemer	$16 25 to 16 35
No. 1 Foundry	16 75 to 17 00
No. 2 Foundry	16 25 to 16 50
No. 3 Foundry	15 50 to 15 75
No. 2 Southern	17 35 to 17 60
Gray Forge	15 75 to 16 00
Gray Forge, Southern	15 85 to 16 35
Lake Superior charcoal	18 00 to 18 50

Finished Material.—The mills are having much difficulty in giving satisfactory delivery. Shipbuilders complain of delay in shipments of plates and the mills are also far behind in the delivery of structural material. There has been very little buying of steel bars since the advance to 1.59½c Cleveland, or 1.50c Pittsburg, was made. The bar iron business is somewhat irregular and does not seem to have been benefited by the advance in steel bars. Western mills are selling at 1.55c at their plants, but in this territory quotations are usually from 1.60c to 1.65c at the mills. There is a fair demand for sheets. The prices of the principal producers through jobbers are as follows: Cleveland delivery, the freight from Pittsburg being 9½ cents: Mill sales of black sheets in carload lots No. 10, 1.84½c; Nos. 11-12, 1.89½c; No. 14, 1.94½c; No. 16, 2.04½c; No. 27, 2.39¼c; No. 28, 2.40¼c. Galvanized, mill sales, No. 14, 2.64½c; No. 16, 2.74½c; Nos. 18-20, 2.89½c; Nos. 22-24, 3.04½c; Nos. 25-26, 3.24½c; No. 27, 3.44 1-3c; No. 28, 3.64½c. Out of stock, black sheets, ¼ in., 1.85c; 3-16 in., 1.95c. Blue annealed, No. 10, 2.05c; No. 12, 2.10c; No. 14, 2.15c; No. 16, 2.25c. One pass cold rolled: Nos. 18-20, 2.45c; Nos. 22-24, 2.50c; No. 26, 2.55c; No. 27, 2.60c; No. 28, 2.70c; No. 30, 3.10c. Galvanized out of stock, No. 16, 2.95c; Nos. 18-20, 3.05c; Nos. 22-24, 3.50c; No. 26, 3.40c; No. 27, 3.60c; No. 28, 3.80c; No. 30c, 4.60c.

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Steel axles	16 50 to 17 00
Malleable iron (railroad)	15 00 to 15 50
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Heavy steel	16 00 to 16 50

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No. 1 machine cast	14 50 to 15 00
Iron axles	19 00 to 20 00
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Wrought turnings (free from cast)	10 00 to 10 50
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Pipes and flues	13 00 to 14 00
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Sheet iron	7 00 to 8 00
Wrought drillings	12 00 to 12 50
Stove plate	10 50 to 11 00
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CINCINNATI.

March 7.

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took 1,000 tons of No. 4 foundry on the basis of $12.75 Birmingham. An electrical manufacturing concern in the Pittsburg district bought 2,500 tons and has an inquiry in the trade for 11,000 tons additional. The general inquiry has been moderate. Sales agencies have made a rather strong campaign during the week in an effort to induce buying, some with gratifying success, while others report disappointment. It seems clear that the smaller melters of iron are well enough supplied to cause them to regard talk of advancing prices with complacency and efforts to induce them to cover their wants for the future at present prices result in but little business. Most of the Southern furnace interests are willing to take orders for second half delivery at present quotations, although a few are unwilling to sell beyond the third quarter. The Southern market is firmly maintained at $13.50 for No. 2 foundry, Birmingham, although some well sold up furnaces are asking $13.75 and $14. Southern Ohio furnaces are reported to have taken business during the week on the basis of $15.50 to $15.75 for No. 2 foundry at furnace. We quote f. o. b. Cincinnati as follows:

Southern Foundry No. 1	$16 75 to 17 00
Southern Foundry No. 2	16 25 to 16 50
Southern Foundry No. 3	15 75 to 16 00
Southern Foundry No. 4	15 25 to 15 50
Southern Foundry No. 1, soft	16 75 to 17 00
Southern Foundry No. 2, soft	16 25 to 16 50
Gray Forge	15 00 to 15 25
Northern Foundry No. 1	17 40 to 17 65
Northern Foundry No. 2	16 90 to 17 15
Northern Foundry No. 3	16 40 to 16 65
Southern Charcoal	19 50 to 19 75

Finished Material.—No price changes are reported this week but the market is active and strong. Jobbers report an active small order trade and increasing difficulty is getting prompt deliveries from the mills. All descriptions are inquired for indicating liberal consumption. Bar iron is quoted at 1.75c; steel bars at 1.63c, half extras, with dealers quoting 1.85c for iron and steel out of store. Galvanized sheets at 75 and 7½ percent off. We quote black sheets, No. 27, at 2.40c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 2.70c; No. 27, 2.60c; No. 16, 2.20c; No. 14, 2.10c; No. 12, 2.05c; No. 10, 2c. Tank plates are firm and sell out of stores at 2c for ¼-in. and 2.10c for 3-16 No. 8 and No. 10. Beams and channels are quoted at 2c from stock, and angles at 2c to 2.05c for base sizes.

In merchant pipe the market holds firm at the recent advance. Mills are reported to be filling carload orders with reasonable promptness and with prices well maintained conditions are quite satisfactory. We quote f. o. b. Cincinnati:

MERCHANT PIPE.

(Basing Discounts.)

	Steel Pipe.		Guaranteed. Wrought Iron Pipe.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ and ¼ inches	65.85	49.85	63.85	47.85
⅜ and ½ inches	69.85	57.85	67.85	55.85
¾ to 6 inches	73.85	63.85	77.35	62.35
7 to 12 inches	68.85	53.85	67.35	51.85

Old Material.—The market continues dull and prices are largely nominal and without quotable change. We quote:

Old No. 1 railroad wrought, net tons	$16 50 to 17 00
Cast machine and foundry, net tons	13 50 to 14 00
Old iron rails, gross tons	20 00 to 21 00
Old steel rails, gross tons	15 00 to 15 50
Old short lengths, gross tons	14 00 to 14 50
Old iron axles, net tons	19 00 to 20 00
Stove plate, net tons	9 50 to 10 00
Wrought turnings, net tons	12 50 to 13 00
Cast borings, net tons	9 00 to 9 50

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1215, No. 150 NASSAU ST., March 7.

Pig Iron.—The past week in the local pig iron market was marked by a continuance of the activity which has prevailed for several weeks. While several round lots changed hands, the feature has been the steady buying of small quantities. Altogether the tonnage of the week was considerable. Perhaps the most important development of the week has been the improved demand from foundrymen. Buying from this branch of the trade has not been as pronounced as from other branches, but it begins to look as if the future will tell a different story. Several advices from founders are to the effect that business is growing better as the year progresses. Prices are now held more firmly than at any time since the year opened. For small lots some interests say they are receiving 25 cents more per ton than a fortnight ago, but large orders can be placed at unchanged prices. In Northern irons, No. 2 foundry rules from $16.50 to $16.75 at Eastern Pennsylvania furnaces, with sales generally speaking at the former figure. Southern No. 2 foundry still commands $13.50 at the furnace, and where a good order is in prospect, there is no difficulty in placing it at this price. Small lots, however, have sold at $13.75. Taking the situation as a whole, sales of Northern brands have been much heavier than of Southern during the past week, with most of the buying calling for delivery between now and August 1. So far as inquiry goes, it can be said to be healthy. New York quotations at tidewater follow: Northern No. 1 foundry, $17.75 to $18; No 2 foundry, $17.25 to $17.50; No. 2 plain, $16.75 to $17; Southern No. 1 foundry, $17.50 to $17.75; No. 2 foundry, $17 to $17.25; No. 3 foundry, $16.50 to $16.75; No. 4 foundry, $16 to $16.25. Pig iron warrants are as follows:

	Bid.	Asked.
March	$16 60	$16 90
April	16 60	16 90
May	16 80	16 85
June	16 80	17 00
July	17 00	.....

Finished Iron and Steel.—While there were very few contracts of any size booked in structural shapes during the past week, small business taken made up an excellent tonnage. The American Bridge Co received an order for 2,500 tons from the Indiana Harbor Railway, an additional order of 1,200 tons from the C. W. & D. Railroad, and some scattering lot orders from several roads aggregating a fair tonnage. Structural business in sight presents a much brighter appearance, the most notable being some 23,000 tons for prospective manufacturing enterprises. Some time ago we noted 10,000 tons for the new dry goods store of B. Altman & Co. in this city. Plans for this structure were filed with the local building authorities during the past week, and this order is expected to be forthcoming shortly. The 7,500 tons for the New York Central, noted last week, is still unplaced. Last week a telegraphic mistake put the American Bridge Co. down as having taken a 1,000-ton contract from the Philadelphia Transit Co. It should have read 10,000 tons. Plates continue to be fairly active, with the outlook better. Sheets are only in moderate demand. New York prices at tidewater follow: Angles, 3 to 6 in. x ¼ in. and heavier, 1.74½c; beams, 3 to 15 in., 1.74½c; channels, 3 to 15 in., 1.74½c; beams, 18, 20 and 24 in., 1.84½c; tees, 3 x ¼ in. and heavier, 1.79½c; plates, carloads, tank, 1.74½c; flange, 1.84½c; marine and ordinary firebox, 1.94½c; refined iron bars, 1.64½c; soft steel bars, 1.64½c to 1.67c; sheets, in carload lots, New York, No. 28, black, 2.50c to 2.55c; galvanized, 3.60c to 3.70c.

Old Material.—While the volume of trade last week was light, the general market continued strong, with holders for the most part rejecting offers made them. This is especially true of heavy steel scrap, which could easily command $16, but which holders are asking from 25 to 75 cents per ton higher. Mill agents in consequence are sounding the foreign market, with the chances small for making any headway for the time being, the prices asked being even higher than here. The other branches of the market are without particular interest. Approximate prices here f. o. b. cars follow:

Old iron rails	$20 00 to 22 00
Old steel rails, long lengths	16 00 to 17 00
Old steel rails, short pieces	15 50 to 16 50
Relaying rails	21 00 to 22 00
Old car wheels	17 50 to 18 25
Old iron car axles	21 75 to 22 75
Old steel car axles	19 00 to 19 75
Heavy melting steel scrap	16 00 to 17 00
No. 1 railroad wrought scrap	20 00 to 20 50

Iron track scrap	17 00 to 18 50
Wrought pipe	15 00 to 15 50
Ordinary light iron	12 00 to 13 00
Cast borings	10 00 to 10 50
Wrought turnings	13 50 to 14 00
No. 1 machinery cast	16 00 to 16 50
Stove plate	13 50 to 14 00

PHILADELPHIA.

March 7.

Heavy demand for pig iron is still the leading feature of the market. The large sales are attributed to the fact that consumers believe they are safe in taking at present prices all the iron they will need for six to eight months.

Pig Iron.—A large amount of business has been transacted, mostly in selling steel making irons, of which it is estimated 150,000 tons have been ordered during the past two weeks. Foundry irons are in fair demand. Some furnaces have been shifted from foundry to basic. We quote as follows: No. 1 X foundry, $17.75 to $18; No. 2 X foundry, $17.50 to $17.75; No. 2 plain, $17 to $17.25; standard gray forge, $16.25 to $16.50; ordinary gray forge, $15.75 to $16; basic, $16.75 to $17; low phosphorus, $20.25 to $20.50.

Finished Material.—The demand is well maintained, but there is no great rush of new business. Specifications are coming in satisfactorily. We quote as follows: Beams, channels and angles, according to specifications, $1.73½c to 1.85c; refined iron bars, 1.63½c to 1.80c; steel bars, 1.63½c to 1.65c; plates, 1.73½c to 1.75c.

Old Material.—Demand is limited, but prices are firmly maintained. We quote: No. 1 steel scrap, $17.50 to $18; low phosphorus scrap, $20.50 to $21.50; old steel axles, $20 to $21; old iron axles, $23.50 to $24; old iron rails, $23 to $24; old car wheels, $16 to $16.50; choice railroad No. 1 wrought, $21.50 to $22.50; machinery scrap, $15.50 to $16; wrought turnings, $15 to $15.50; cast borings, $11.25 to $11.50; stove plate, $13.50 to $14; wrought iron pipe, $16 50 to $17.

BIRMINGHAM.

Birmingham, Ala., March 6.—Southern iron manufacturers continue to sell iron at a lively rate and it is announced that the better portion of the make for the first half of the year has been sold. Orders are being booked on which delivery extends into and through the third quarter of the year. Prices have stiffened a little lately with some sellers and No. 2 foundry has sold at $13.75 and in a few cases close to $14. One company reports the sale of 1,000 tons of No. 1 foundry iron at $14.45 and 1,000 tons of No. 2 foundry at $13.95. The production in Alabama is still lagging, two furnaces having banked.

The announcement made today that the negotiations for a merger of the Southern iron and coal interests were off did not cause much of a sensation. As soon as it was stated that the Tennessee Coal, Iron & Railroad Co. directors were opposed to a consolidation or denied that a control of their stock had been bought on the open market, there were doubts expressed that the deal would go through. President J. C. Maben, of the Sloss-Sheffield Steel & Iron Co., has left New York. The annual meeting of the Sloss-Sheffield Co. is due to be held this month. On account of the recent negotiations it is possible that the meeting will be a little delayed, possibly until the 21st or the 28th inst.

Efforts are being made to increase the production in this district, but there are no indications of success in this line for some little time yet. The Virginia mine, where the explosion took place on Feb. 20, will probably be in condition for operation by April 1. The fire in the Sumter mine, Blue Creek region, Jefferson county (T. C. I. & R. R. Co.), has been extinguished, but it will be four weeks before the mine can be operated again. The coal from the Sumter mine was used extensively in the manufacture of coke, the better part of which was used in the furnaces at Bessemer.

The following quotations are made: No. 1 foundry, $14 to $14.50; No. 2 foundry, $13.50 to $14; No. 3 foundry, $13 to $13.50; No. 4 foundry, $12.75 to $13; gray forge, $12.25 to $12.50; No. 1 soft, $14 to $14.25; No. 2 soft, $13.50 to $14.

Steel conditions show a little change. The production is not as steady as it has been.

No further announcements are made as to the Birmingham rolling mills. The unsatisfactory conditions are not definitely stated. It is not known when the mills will resume operations.

The Birmingham Stove & Foundry Co. has been organized with $25,000 capital stock. J. B. Gibson, C. E. Thomas, T. F. Wimberly, W. E. Estes, E. M. Chestnutt, J. M. Jolley and H. F. Maus are the incorporators. A plant will be erected at once to manufacture stoves and do a general foundry business. This is the third stove works for the Birmingham district.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, NO. 150 NASSAU ST., March 7.

Pig Tin.—From a trade standpoint the market during the past week could hardly have been more quiet. Prices showed a weakening tendency, and give very little evidence now of strengthening. The London market for the week, on the other hand, however, was just the reverse of this, being both active and higher. Today's closings follow. Spot, 28.75c to 29c; March, 28.87½c to 29c; April, 28.50c to 28.90c; May, 28.50c to 28.75c. London's closings today follow: Spot, £133 7s 6d; futures, £132 5s. Arrivals for the month to date aggregate 1,755 tons, with 3,050 tons afloat.

Copper.—The market continues without a single feature of interest. Prices are nominally unchanged, but the trade situation has retrograded, if anything, export buying especially. London for the week was active, with prices not as strong as a week ago. Today's closings follow: Lake, 15¼c to 15⅜c; electrolytic, 15⅛c to 15¼c; casting, 14⅞c to 15c. London's closings today follow: Spot, £67 18s 9d; futures, £68 6s 3d. Exports for the month to date aggregated 1,620 tons.

Lead.—Is quiet and unchanged at 4.55c to 4.60c. St. Louis remains at 4.35c. London slightly higher at £12 13s.

Spelter.—Is dull and unchanged at 6.10c to 6.25c. St. Louis is strong at 6.15c. London declined to £23 15s.

Antimony.—All brands unchanged, Cookson's and Hallett's being 7⅞c to 8⅛c, and other brands 7c to 7⅜c.

Quicksilver.—We quote $38 per flask of 75 lb. lots of 100 flasks. London is £7 12s 6d.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1164 MONADNOCK BLOCK, March 7.

The metal market continues very quiet in all its branches. Prices are soft in places, but there is not enough demand to determine accurately the condition of the market. Some dealers are willing to shade prices on desirable orders, while others are holding firm to established quotations. Pig tin has been reduced a quarter of a cent, and is now quoted in carload lots at 29¾c, and in less than carload lots at 30c. Cookson's antimony has been reduced half a cent, and is now quoted on the same basis as Hallett's, 9c. Other prices are as follows: Lake copper in carloads, 15⅜c; less than carload lots, 15⅝c. Casting copper in carloads, 15⅛c; less than carload lots, 15⅜c. Spelter, 6¼c to 6½c for carload lots, and 6½c to 6¼c for smaller lots. Sheet zinc is unchanged at 7¼c for carload lots of 60 lb. casks, and 7½c for less than carload lots. Pig lead, 4.45c for 50-ton lots; 4.50c for carload lots, and 5c for less than carload lots. Nickel is 45c to 60c, according to amount and deliveries.

There is a fair demand for old metals, and prices are stronger than a week ago. Quotations are approximately as follows: Copper wire, 13¼c; heavy copper, 12¾c. Light copper, 11¾c. Red brass, 11¾c; red brass borings, 10½c. Yellow brass, 8¾c; yellow brass borings, 7½c. Pipe lead, 4c. Tea lead, 3.60c. Zinc, 4¼c.

EASTERN PENNSYLVANIA.

HARRISBURG, Pa., March 7.—Furnaces are being repaired and put into blast in this part of the Keystone State and signs all point to a busy summer. The most pronounced activity is in the Lebanon group, where two of the Lackawanna Steel Co.'s Colebrook furnaces are now working, having been started since the first of the month, and three others are being repaired for an early start. The Pennsylvania Steel Co. is repairing two furnaces at North Lebanon and will start one within a month, while the Lebanon Valley furnace is being rebuilt. One furnace will be started by the Berkshire Iron Co. at Sheridan and another later on. Robesonia will be blown in within a month. In the Schuylkill and Lehigh Valleys conditions are equally favorable. Active furnaces are being pushed and idle ones made ready for work. In the Juniata Valley several stacks will start soon, three being now under repairs, while two have started since the first of the year. In the Lower Susquehanna Valley six furnaces are now at work and the probabilities are that two or three more may start. The latter include the stacks of the Susquehanna Iron & Steel Co. in York and Lancaster counties.

The Middletown Car Works have been reorganized with a charter from the state under the name of the King-Lawson Car Co. and a capital of $50,000, for the manufacture of cars with new patented devices.

The Reading Iron Co. is rebuilding some of its mills and will enlarge the Scott works, and a large puddle mill may be built to give work to 300 more men. Conditions about Reading are reported to be good.

At Columbia the Jansen Iron Co. is planning to erect a large works, removed from Oxford, N. J.

Both the Pennsylvania and Reading railroads have increased the forces and hours at their shops in this part of the state, there being renewed activity in Reading and the anthracite region because of demand for mine cars. The Pennsylvania's Altoona, Harrisburg and Columbia shops are rushed.

The car works at Berwick have taken orders for cars for Santo Domingo, placed within the last few weeks. The American Car & Foundry Co.'s plants at that place and Bloomsburg are working on a large order for the Pennsylvania Railroad.

At York the rolling mills of the Susquehanna Iron & Steel Co. have started up after a long idleness. Large shipments of implements and vehicles are being made by the Hench & Drumgold Co. and the A. B. Farquhar Co., of the same city. The former company has shipped eleven saw mills to South America and several to Cuba.

Every department of the Bethlehem Steel Works is in operation and a large order for railroad material for Mexico is being filled. The improvements are being carried forward in several mills about the plant.

The Tacony Iron Co. will discuss a proposition to increase its capital from $50,000 to $200,000.

Part of the coke ovens at the Colebrook plant of the Lackawanna Steel Co. will be started in April.

The Eyre Construction Co. has taken from the state of Pennsylvania a contract for a bridge at Selinsgrove, Pa., to cost $64,975. Three more contracts are to be let on March 23. For the bridge let there were twenty-seven bidders.

The American Steel Foundries plant at Chester has made a number of monster castings lately. One, a rudder frame, was for one of the new warships.

The Allegheny Steel & Iron Co., Pittsburg, fired this week its new 35-ton acid open-hearth furnace at its plant, Breckenridge, Pa. One 50-ton open hearth furnace is also under erection and a 72-in. plate mill is being installed. The Inter-State Steel Co., a subsidiary company of the Allegheny Steel & Iron Co., this week placed its new 28-in. sheet mill in operation for the first time. A new sheet mill is also to be installed at the Breckenridge plant.

CANADIAN INDUSTRIAL NEWS.

TORONTO, Can., March 6.—Steel rails are being shipped by the Canadian Pacific Railway from Sault Ste. Marie at the rate of ten to fifteen carloads daily and distributed along the branch line under construction from Sudbury to Toronto. This line is nearly 300 miles in length and will shorten the route between Toronto and Winnipeg by about 60 miles.

The project for the erection of extensive works at Morrisburg, Ont., by the Canada Steel & Tin Plate Co. is taking shape in connection with the development of electric power for the town. A by-law is being submitted to citizens authorizing a loan of $76,000 for electric development. Should this be adopted the company agrees to erect mills employing 400 men at a cost of $300,000 and to buy electric power from the municipality at $12.50 annually per h. p.

An inquiry has been set on foot by the Niagara Power Commission as to the cost and best mode of developing electric power at Niagara Falls and transmitting it to points in Western Ontario. This body constituted under an act of the Ontario Legislature, represents the municipalities of Toronto, London, Guelph, Woodstock, Brantford, Stratford and Ingersoll. The commissioners have appointed Ross & Holgate, electrical and hydraulic engineers, of Montreal, to carry out the field engineering inquiry. An investigation has been started to obtain data as to the amount and cost of power now used as a basis for calculations as to the financial advantages of the undertaking. The Toronto branch of the Canadian Manufacturers' Association has issued a circular to its members urging them to co-operate with the Commission by furnishing all information necessary to facilitate the inquiry.

The following companies have been incorporated under the laws of Ontario: Thompson & Livock, Ltd., capital $40,000, head office, Ottawa, to carry on business as iron founders. Provisional directors: Lewis H. Thompson, James Livock and F. X. Laderoute, all of Ottawa. Thomas Lawson & Sons, Ltd., capital $50,000, head office, Ottawa, as iron founders. Provisional directors: Thomas Lawson, Chas. T. Lawson, Alex T. Lawson, R. M. Lawson and John Lawson, all of Ottawa.

National Tube Co. Improvements.

(Special Telegram.)

PITTSBURG, March 8.—The execution of the improvement program decided on more than two years ago for the McKeesport works of the National Tube Co. is now proceeding rapidly. Removal of tracks from property decided upon for the extensions has been favorably acted upon by the railroads. The blast furnace plant has been practically rebuilt and another furnace is to be added. The entire work involves an expenditure of about $10,000,000. Much of the machinery to be installed is already built, but the program is so extensive that it will require from two to three years to complete the extensions. At Lorain one furnace in the new pipe mill has been in operation since Feb. 20.

A decision rendered by the United States circuit court of appeals, at New York, affirms the finding of the lower court, and also the ruling of the board of general appraisers in declaring that metals assessed as wrought iron under section 183 of the tariff act were properly dutiable as metals not otherwise provided for under the similitude clause of the act of 1897. The decision grew out of a protest against the assessment by the collector of 20 percent ad valorem on a quantity of merchandise invoiced as ferro-chrome, ferro-tungsten, ferro-molybdenum and ferro-vanadium. The minerals, which are used in crucibles to harden armor plate and projectiles, were classified by the appraiser as metal unwrought, and were accordingly assessed. The importers claimed the ferros should come in under another section at $4 a ton along with pig iron and scrap.

THE EAST BOSTON TUNNEL.

On the 31st of December last, the first train carrying passengers passed through the East Boston tunnel. The tunnel is a part of the Boston system of subways, and passes under the harbor, uniting by a rapid transit line Boston and East Boston. The Act authorizing the building of the tunnel was signed June 10, 1897. The first contract was made in April of 1900, and active construction was begun very soon after. The completion of the tube has therefore required almost five years, during which a good average of daily progress has been maintained. Considering its magnitude, the work has been remarkably free from accidents and has been carried on with practically no injury to adjacent property.

Three passenger stations are provided, located for convenient connection with existing surface and elevated lines. The work, in part of its course, was pushed under some of the busiest streets of the city, yet there was little interference with traffic.

The total length of the tunnel is approximately 7,500 ft., of which fully two-thirds was built by the shield method, the remainder in open cut excavation. The portion of the bore actually under the water of the harbor is about 2,700 ft. long, the balance of the tunneled portion passing through "made ground" filled in as the growth of the city demanded. Test bores were made along the line of the tunnel, so that the materials to be penetrated were known in advance with reasonable accuracy. A depth greater than at present essential was demanded owing to the fact that allowance had to be made for possible dredging of the harbor to make a 40 ft. channel. To meet this condition different grades were required in the tube. For the first 2,100 ft. from Maverick Square the tunnel descends by a 5 percent grade; for the next 2,100 ft., reaching almost across the harbor, an ascending grade of 0.5 percent is maintained; then follows a length of 1,000 ft. at 2.5 percent, 1,800 ft. at 4, 2.5 and 1.5 percent, and the final rise on a 3 percent grade for perhaps 500 ft. The greatest depth attained by the tunnel invert is about 80 ft. below mean low water. The least thickness of earth between tunnel and water is 18 ft. The cross-section of the completed structure varies at different points but in general is the well-known horseshoe type. The bore is lined throughout with concrete, reinforced where necessary by steel rods bedded in. Ventilation is provided by powerful fans forcing fresh air from either end and electric lights illuminate the interior.

In construction the line was divided into six sections, lettered from A to F. Of these, sections B and C were driven by straight tunnel methods; the other sections were built in open cut. The methods used in open cut were in general those of common practice; there were no novel features of striking interest, the streets were simply excavated to level and the concrete tube built in position, the timber framework being left in place for thirty days to allow the concrete to harden. The excavated material was then filled over all and normal surface conditions restored. This construction differed from that used in the New York subway, in that concrete was used entirely instead of the steel structure adopted in New York.

Sections B and C aggregate 5,150 ft. in length, and so form the major part of the contract. They are most interesting as having been constructed wholly by sub-surface tunneling methods. Section B, 4,400 ft. long, was started at a shaft in Lewis Street and was driven by the pneumatic shield method, almost the entire distance being made under air pressure. The air locks were three in number; the one near the top of the tunnel section being used almost exclusively by the men, the two lower ones giving exit to the excavated material. The side walls of the tunnel were built in advance of the shield in lateral headings. The roof shield, a heavy structure of steel work, was forced forward by powerful hydraulic jacks, supported on rollers resting on plates on the walls. The air pressure required averaged about 22 lb.; the maximum was sometimes as high as 27 lb. The volume of free air delivered to the headings averaged about 20 cu. ft. per minute for each workman and it was forced into both side drifts and above the shield, as well as in front of it. The compressing plant for this section included three Ingersoll-Sergeant air compressors; two low-pressure straight-line single-stage machines furnishing air for the working chamber in the shield; and one high-pressure straight-line two-stage machine delivering air at a pressure of about 115 lb. This high pressure air was used in pumps operating the hydraulic jacks for moving the shield, developing a pressure of 4,000 lb. per square in., applied in the sixteen jacks of 75 tons capacity each. This air was also used in driving motors running concrete mixers, winding engines, and other devices; while a portion was discharged direct into the advance headings for ventilation. The combined free air

FIG. 1.—THE EAST BOSTON TUNNEL OF THE BOSTON SUBWAY SYSTEM.

capacity of these three compressors was something over 2,500 cu. ft. per minute and they were driven by steam from a battery of three 100 h. p. boilers.

Section C, 750 ft. in length, included that portion of the line between Atlantic Avenue and India Street. The method of tunneling was in general that used in Section B, starting from a construction shaft near the Custom House. The shield used here was very similar to that in the other tunnel section and it was manipulated in the same manner. Three air locks gave access to the working chambers. The air pressure in front of the shield averaged about 18 lb. The compressed air for this section was supplied by four Ingersoll-Sergeant steam-driven air compressors. Of these, two were straight-line high pressure machines, having a combined capacity of about 1,500 cu. ft. of free air per minute, delivered at 120 lb. pressure; the other two were low-pressure machines of straight-line type, with an aggregate free air capacity of 2,300 cu. ft. per minute, compressed to 40 lb. The low pressure air gave ventilation and pressure in front of the shield; the high pressure air served as a motive power for pumps, winding engines and other appliances.

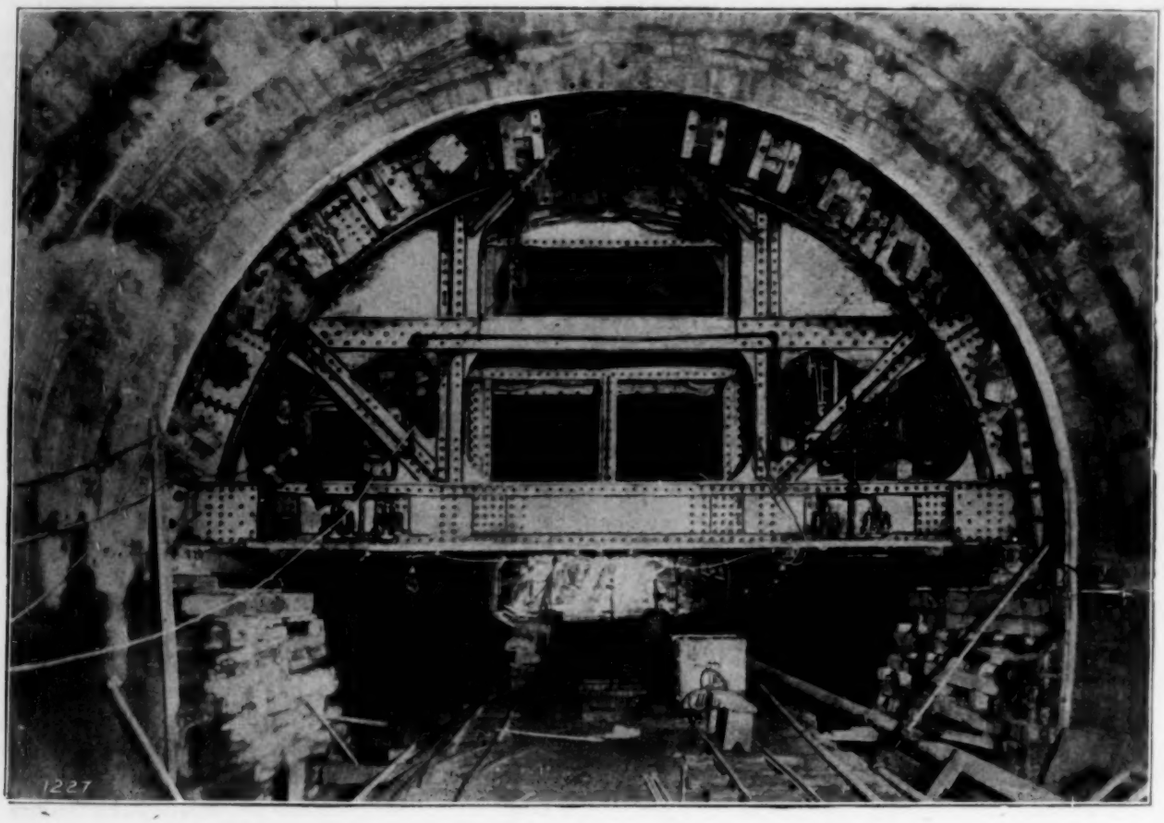


FIG. 2.—THE PNEUMATIC SHIELD AT WORK IN BORING THE EAST BOSTON TUNNEL.

The total cost of the tunnel complete has exceeded three million dollars. The work was completed in the contemplated time and the methods of construction were found in every way satisfactory. The opening of this tunnel to traffic has reduced the time of transportation between Boston and East Boston by more than ten minutes and the improved facilities are far-reaching in their influences.

February was the busiest month in the history of the Pere Marquette shops at Muskegon, Mich. Over 20 coaches are being overhauled at present. The old car machine shops has been turned into a car repair shop, and the upholstering department has been moved into this shop. A force of 250 men is employed.

TRADE PUBLICATIONS.

Another page for the catalogue binder comes from the Gisholt Machine Co., of Madison, Wis. It treats of the tools suitable for a wide range of turret work and these are discussed in but a general way, the limited space not permitting an extended exposition. The aim of the company has been to furnish machines and tools so that they are quickly adjustable from one piece of work to another. When the machines are equipped with boring tools and arbors for standard holes the necessary addition to the supply for making any ordinary pieces can be made at comparatively small cost.

Two pamphlets from the Greer Filter Co., of Philadelphia, deal with water purification. One of the pamphlets is entitled "Filtration" and a number of plants are illustrated. The other pamphlet, "Soft Water," describes the largest water softening plant, the one in operation by the Tennessee Coal, Iron & Railway Co. at Ensley, Ala., as well as installations at the Cleveland Furnace Co., Cleveland, the Minnequa Works of the Colorado Fuel & Iron Co., Pueblo, Col., etc.

The Allentown Rolling Mills of Allentown, Pa., manufacture the Aldrich electric pump. A complete description with several half tone and line engravings are given in a recent catalogue, No. 7. The pamphlet has a number of useful tables.

The Badger State Machine Co. of Janesville, Wis., has a new catalogue of punches and shears. These are built in numerous sizes and styles. Representative machines of this make have already appeared in the columns of *The Iron Trade Review*.

Catalogue 56 from the Whitman & Barnes Mfg. Co. of Chicago, deals with twist drills, reamers, solid and screw wrenches, spring cotters, flat spring and riveted keys, files, etc. Cold chisels and hand punches from selected tool steel stock are made in several sizes by the firm and drop forged thumb screw blanks—both plain and with shoulders, thumb nut blanks, ma-

chine handles, all steel screw drivers as well as screw driver bits are also listed in a profusely illustrated catalogue. A table of decimal equivalents is also given and is unusually complete. It gives the diameter to four places of decimals of drills from No. 80 of the standard gauge, 5 millimetres and 1-16-in. up to 3 in.; drill gauge, millimetre, letter and fractional inch sizes appearing in a single table and in regular order.

"Centrifugal Pumps" is the title of a pamphlet from the De Laval Steam Turbine Co. of Trenton, N. J. A series of illustrations, sectional and half tone, shows the various forms the machine assumes to meet regular and special cases. The report of an efficiency test by Professors Denton and Kent shows how closely the company's engineers can cope with the requirements for maximum efficiency at any given head and quantity.

The monthly stock list of A. M. Castle & Co., iron and steel merchants of Chicago, has an imposing array of railway and boilermakers' supplies, structural material, etc. There is also some mention of the ingenious computers devised by this company for determining strength of boiler rings, riveted joints etc.

The general catalogue, No. 15, from the C. O. Bartlett & Snow Co. of Cleveland, is a pamphlet of 337 pages. The contents are minutely indexed and there is also a useful classification by sectional indexing. This machinery for elevating and conveying is subject to so many variations that it is impracticable to show a comprehensive list of illustrations for any specific class of work. A very satisfactory showing is made of the general application of the machinery and many of the parts entering into the machine construction appear in detail. These tables of dimensions will be found of material assistance to engineers.

A paper on the circulation of steam for heating purposes "at or below the pressure of the atmosphere" was read by request before the American Society of Heating and Ventilation Engineers in 1895. The author, Reginald P. Bolton, has rewritten the paper in order to bring recent advances in practice into the subject matter and the reprint is circulated by Warren Webster & Co. of Camden, N. J. The difficulties met in the application of exhaust steam to heating purposes are treated with the aid of diagrams detailing representative installations.

The Morse rocker joint and the chain of which it forms so important an element are described in catalogue No. 7 from the Morse Chain Co. of Trumansburg, N. Y. The popularity of the drive is shown by the fact that there are now over 40,000 h. p. in daily use and that for the past two years chains of this kind have been in successful operation at speeds up to 2,000 ft. per min. A number of typical installations are shown with illustrations of the dissected chain elements. A report by George Hill of New York, on the merit of this particular drive for transmitting power from electric motors to line shafting, counter shafts, individual machines and tools, accompanies the catalogue.

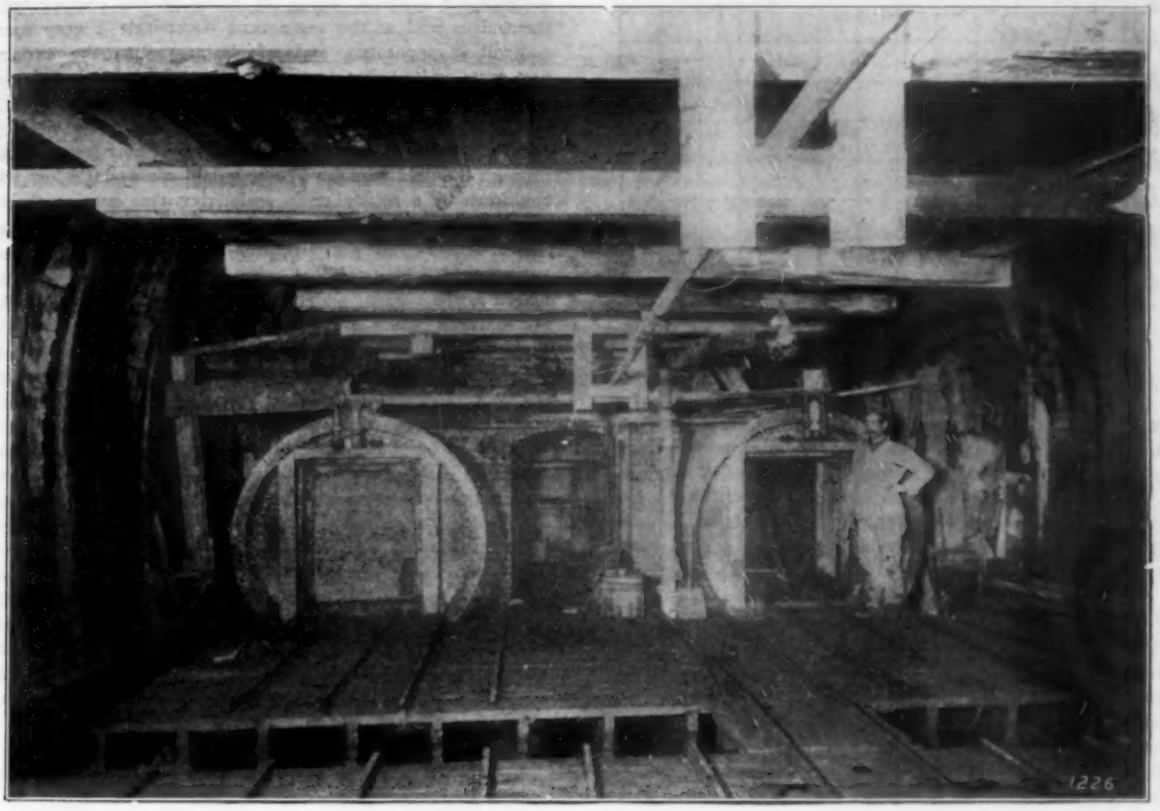


FIG. 3.—THE AIR LOCK ENTRANCES.

The Jeffrey Mfg. Co., of Columbus, O., sends out as bulletin "A" a description of a novel coal and ashes distribution plant at Reese's Station, O. This is at the power plant of the Scioto Valley Traction Co. The account is announced as one of a number to form a reference series in the way of economical disposal of material.

Two pamphlets from W. H. Anderson & Sons, Inc., of Detroit, illustrate in the one case caulking tools and cold chisels, center punches, reamers, hammers, tongs, screw drivers, firing tools, etc., and the other pamphlet deals more specifically with special forgings. The firm has been hammering at this business since 1871 and some of the shapes illustrated are suggestive of a high order of workmanship. One point is made in regard to first cost which is worth repetition: "Difference in cost is a thing to be met but once—the difference in strength and wear is continuous and cumulative."

ELECTRIC DRIVE.*

BY E. L. WALKER.

The economic operation of any given shop is always dependent on a number of considerations, each one of which must claim its proper amount of attention. The establishment of electric drive, or of a system of cranes, or the paying of men by the piece-work plan, or the adoption of any one of a dozen modern methods, will not in itself raise the shop to its highest efficiency. That state can only be attained by a careful regard being given to all sides of the varied and complicated problems which relate to the operation and management, and which first arise with the planning and designing of the shop buildings; however, even after a given shop has been in successful operation for a number of years, it is often quite possible to increase its efficiency, and sometimes to a large extent, by the adoption of one or more of the more modern methods, or by a more careful attention to some detail of the present practice. Often by simply changing the belts on a machine from single to double thickness an increase in the roughing cuts may be made possible which will greatly facilitate the work. Often, too, by the adoption of a wider finishing cut a great deal of time can be saved.

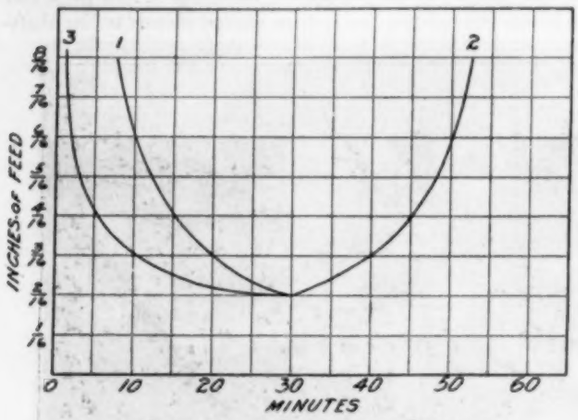


FIG 1.—CURVES SHOWING FEEDS AND TIME SAVED.

If it takes an hour to run the finishing cut across a piece of work on the planer at $\frac{1}{16}$-in feed, it will take one-half an hour at a $\frac{1}{8}$-in. speed, thus saving thirty minutes. Another increase of $\frac{1}{16}$-in. in the feed, making the total $\frac{3}{16}$ of an in., will allow of finishing the piece in twenty minutes; thus saving ten minutes more. The first increase of $\frac{1}{16}$ in. in the feed saved thirty minutes, while the next increase of the same amount saved only one-third as much, or ten minutes. The table shows this calculation carried on to a feed of ½ in., which is not at all excessive, as often 1-in. feeds are taken on comparatively smooth work with good results. It will be seen from reference to the last column that the first increase of $\frac{1}{16}$ of an inch in feed saved more time than all the other increases added, up to a total feed of ½ in., in the first case thirty minutes being saved and in the second a further saving of 22.5 minutes being attained. Putting it in another way, we may say that, given a certain job requiring one hour to complete the cut at $\frac{1}{16}$-in. feed, as much saving may be made by increasing the feed $\frac{1}{32}$ of an inch as will be further gained by an additional increase of $\frac{1}{32}$ of an inch, making a total feed of $\frac{2}{16}$ of an inch. The table is shown graphically by the curves in Fig. 10. These curves are plotted between feeds expressed in sixteenths of an inch, and time expressed in minutes. Curve 1 shows the time required to do the piece, 2, the time saved, and 3 the time saved by each increase in feed. These calculations show the advantage to be gained by very small improvements, and that given a case, any improvement in it, however small, will probably be productive of more economy than any improvement along the same line which will be made afterward. The same calculations may be made for the gain in production by deeper cuts, increased speed, or any other improvement, and the curves, if plotted, will be similar to those shown.

*From the proceedings of the Engineers' Club of Philadelphia.

Variable Speed Motors.

In the early application of variable speed drive the tendency on the part of the designers was to make the motor an integral part of the tool; on lathes, for example, to embody the motor in the headstock, with the armature built direct on the lathe spindle, the range of speed being accomplished by armature control or by combined armature and field control. It required some time for different manufacturers and users experimenting along this line to find out that this was an impractical solution of direct connection. This brought about the consideration of the multivoltage system and the double commutator systems, which are more or less complicated in themselves and at the same time necessitate a very special controlling apparatus, and which, owing to the excessive first costs and cumbersomeness in operation, are dropping out of use.

The main objection to the combined armature and field control is, of course, its lack of efficiency. The current passing through the field windings, being small, causes little loss when cut down by a resistance in series, but that passing through the armature, being proportional to the work being done and, therefore, very heavy when the motor is working at full load, suffers a proportional loss when cut down by a resistance placed in the circuit; added to this is the annoyance of having the machine, when driven by such a motor slacken speed at a point where the cut is either light or runs entirely out, and speed up as the tool re-enters the work sufficiently to burn the tool.

It has been urged by many motor builders that it was impossible to build a motor to give a great variety of speeds regulated entirely by field control, and that the idea itself was impracticable, owing to the supposed necessary size of the motor for a very small variation of speed. The desirability of such a system, however, led to experiment, and today there are variable speed motors on the market giving a range in speeds of from 1 to 2, to 1 to 5, and in special cases 1 to 6 or 8. Probably some of the best examples of variable speed motor building are furnished by those companies which obtain their variation in speed by a system of field resistance alone, and a comparison of the operation of their motors with those of other systems brings out many points of interest to the users of motors in general.

TABLE OF RELATIVE TIME SAVING.

Finishing Feed	Time Required to do Piece	Total Time Saved	Time Saved by Each Increase in Feed of $\frac{1}{16}$ in.
$\frac{1}{16}$	60	—	—
$\frac{2}{16}$	30	30	30
$\frac{3}{16}$	20	40	10
$\frac{4}{16}$	15	45	5
$\frac{5}{16}$	12	48	3
$\frac{6}{16}$	10	50	2
$\frac{7}{16}$	8.6	51.4	1.4
$\frac{8}{16}$	7.5	52.5	1.1

When the one voltage system and field resistance method of control is compared with the multivoltage and double commutator systems, it shows a large advantage in that the same variation in speed is accomplished in a much smaller frame. This feature of compactness makes it possible to use the variable speed motors on work where it would not be commercially feasible to use any other system, either on account

of lack of space in which to fit the motor or the high first cost where multivoltage and such systems are being considered. The variations of speed with this system are accomplished by using a much smaller form of controlling apparatus than with the other systems mentioned, and one in which the chances of trouble are reduced to a minimum. In the latter case the controlling apparatus is much more complex, and at the same time there is always the danger of the operator permitting the controller to stop between any two combinations, which allows the tool to slacken, and, when the controller is brought on to the next combination, there is danger of not only wrecking the gears, but of burning out the equipment, should the fuses fail to blow or the circuit breaker fail to throw out. With the one-voltage system, using the field method of control exclusively, there is no time when the armature and field circuits are open; consequently the increase and decrease in speed from one step to another is continuous.

With the one-voltage system it is possible to install an equipment in any factory where at present they have direct current without the additional cost of special wiring. This method, therefore, lends itself much more advantageously to the general class of machine-shop practice, as it is possible to connect one of the one-voltage system equipments to any direct current set of mains already installed. This item in itself is of vast importance to the purchaser of any equipment, in that it does not necessitate any delay or special arranging for installing the motor-driven apparatus.

In addition to the added first cost of special apparatus required in the power house, and the motor controllers for the double commutator, two-voltage system, and the multivoltage system, the additional wiring is a large item of expense. The two voltage system requires three wires and the multivoltage at least four wires to each motor, and these wires have to be of larger size than those required in the single-voltage system; so that twice as much copper is required in the first case and three times as much in the second as is required when the one-voltage system is used. This, together with other necessary material and the extra labor required, makes an item worthy of careful consideration.

One of the most important features of this system of control is the fact that it gives the full rated horse-power throughout the range of speeds. There is no other system which can do this, both the multivoltage and the armature-control systems falling off in horse-power as the speed decreases. This performance is extremely objectionable for machine tool drive, in that it is almost invariably the case that the maximum horse-power is required at the slowest speeds at which the tool is driven, and in the use of any other control than this it is necessary, in order to get sufficient power at slow speeds, to equip the machines with a motor of abnormal size and horse-power at the high speeds. Of course, the ideal condition would be to get a constant torque, which would necessitate a larger horse-power at the higher speeds; nevertheless, it is a step in the right direction to get even a constant horse-power at all speeds.

The bases of the belted motors have a belt-adjusting device by which the belt can be tightened by a few turns of the adjusting screw. In the larger sizes the pole pieces can be removed complete, thus allowing of light repairs to the armature without removing it. Motors of this class are sometimes provided with a back gear-shaft, which reduces the number of revolutions to the desired amount without the use of a countershaft. This back gear has bearings on the motor frame. These motors may be operated either on the floor, wall, or ceiling without any change, except to turn the oiling apparatus over into proper position. For ordinary machine tools the manufacturers recommend a motor of speed variation of 1 to 2, where it can be used, as it requires a much simpler controlling mechanism than does a higher ratio.

For lathe work a 1 to 2 variation of speed in the motor, taken in connection with one change of speed in the gears, will give a speed variation at the tool of 4 to 1. Gear ratios can be worked out so that, when the speed has been increased through the range of the motor, another driving gear can be thrown in; so that with the motor running at its slowest speed the tool will have the same cutting velocity as it had just previous to the change; now, the motor may be speeded up through its range and the same process of change of gear accomplished as before, and so on through the entire range of the machine tool, thus giving every possible cutting speed from the slowest to the fastest without any gaps. This arrangement is low in first cost and efficient and convenient in operation.

The actual arrangement of the necessary change of gears has been worked out in slightly different ways by the various manufacturers, some using slip gears, others obtaining the change by means of friction clutches. The friction clutch scheme is very desirable, in that the entire range of speed can be given the tool without the stopping of the motor. This sort of arrangement was illustrated by a Gisholt lathe driven by a variable speed motor. While the builders of this motor recommend a speed variation of 2 to 1 in the usual cases of lathes, boring mills, and machinery of that class, yet they are inclined to believe that such tools as shapers, planers, and milling machines should be equipped with motors giving a speed variation of 4 to 1. The controlling apparatus for a lathe equipment consists of either a drum type or slate front controller attached to a splined rod by a sprocket chain. This rod is operated, through a set of miter gears, by a lever attached to the apron of the lathe. The operator has, therefore, right at his tool carriage, a lever with which he can start, stop, vary the speed, or if necessary reverse the direction of rotation of his lathe, and is therefore in a position to have absolute and easy control of his machine at all times. For surfacing machines the controller can be mounted on any convenient part of the machine, and is then well within the reach of the operator. A controller is furnished for this class of work which is operated by two levers: one starting or stopping the machine and the other varying the speed. This apparatus is, however, so arranged that, should the machine be stopped by the operator, or by the stoppage of the current, or due to an overload opening the circuit breaker, the starting lever is thrown back to the off position, and in returning to that position the field-control lever is brought back to full field. It is, therefore, impossible on any of these controllers to start the machine upon an extremely weak field. All these controllers are equipped with the necessary armature resistance for starting up the machine; but immediately after this is done all this resistance is cut out and the speed variation obtained by field control alone.

Most of these motors are rated on the basis of their operating in one direction, and most machine tool builders at the present time are designing their tools so as to use a motor on one direction of rotation, as it enables them to use a smaller frame for a given capacity, and, in fact, is more desirable from all standpoints. (Mr. Walker then described the Electric Controller & Supply Co.'s planer drive; the speed changing mechanism of the National Machine Tool Co. and the Wm. Sellers Co.'s pneumatic planer clutch, which have been discussed in *The Iron Trade Review*.)

A speed-changing mechanism properly designed to give speeds in the ratios of 1 to 2, to 4 to 8, etc., taken in connection with a variable speed motor with a range of 1 to 2, will give every speed between the lowest and highest range. The application of this combination to an old lathe or other machine would be extremely simple. In the case of a lathe, for example, an annular gear could be shrunk on one of the cones and the end of the shaft fitted with a pinion to mesh with the gear. The variable speed motor could be geared to the shaft and the whole apparatus so arranged as to be carried by the headstock of the lathe. If it is considered undesirable in any particular case to gear the motor directly to a shaft, a chain may be used, thus avoiding a belt, which would necessarily

be of extra large size to meet the main object of this arrangement: *i. e.*, to get the most out of the high-speed tools.

DISCUSSION.

Harold T. Moore.—I made a Prony-brake test recently of two different makes of motors of the single-voltage, variable-speed type, which were rated as 3 h. p. machines with a 6 to 1 speed range. The motor frames were of the size generally used on the standard 12 h. p. constant speed motors, but as they were only tested for their rated value (3 h. p.), a constant h. p. was maintained throughout the range. The minimum h. p. when the field was weakest and the speed greatest evidently determined the rating. At the slow speeds the h. p. available was greater than three, but owing to the excessively strong field necessary for so large a range, a heavy overload could not be maintained for very long at the slow speeds without a considerable heating of the field coils. On the weakest field and with normal load, a slight sparking at the commutator was observed, which was considerably increased with an overload.

The President, Carl Hering.—In defense of the variable speed electric motor I might call attention to the fact that mechanical engineers have also failed to devise a satisfactory variable speed, constant power gear; the electrical engineer should therefore not be blamed too much. Mechanical engineers have tried for many more years to solve this difficult problem, but have not succeeded.

E. L. Walker.—The Baldwin Locomotive Works was one of the first large establishments in this country to introduce the electric drive, and to-day it would be next to impossible for them to operate without it. The shops are situated in the heart of a large city and are necessarily several stories in height. The machines are set closely together, and the larger of these served with overhead traveling cranes. There is no method of operating these tools which allows of the crane service and at the same time proves as flexible and economical as the electric drive. In an establishment of our character the large output necessitates an easy and rapid method of handling all material which cannot be readily moved by laborers. There are about 120 power cranes installed in the works at present, the majority of which serve machine tools. This system is made possible by the employment of electrically driven tools, and though many defects may be found in the various examples of electric drive they are far outweighed by the benefits derived from the use of overhead cranes alone.

David Halstead.—In defense of the electric drive I would like to say that quite a number of the large shops in this country are using electric motors for driving machine tools. There must be some great advantage in using these motors or they would not spend the money for them. The time saved in operating machine tools, and therefore the increase in output, can be traced to this convenient method. The turning of the handle of a controller compared with the shifting of belts to different steps of cone pulleys would result in the choice of the former. Not only is there this convenience, but one has, with the electric drive, a flexible system and a clearer head room than can be had with belt transmission. There is also a great saving in a shop where the power is transmitted through copper wire, with only the resistance of the wire to deal with, compared to the loss of friction due to the long system of belt transmission. Particularly is this so in right-angle drives and vertical shafting. We should further compare the cost of repairs of the moving belts to the fixed copper conductor and the time and convenience for any changes.

Walter Loring Webb.—I always supposed that one great point in this question of electric drives *vs.* belt transmission was the matter of the total power required in the engine room. I had always assumed, especially where the shops are very large and where the system of shafting would have to be very extensive, that the loss of energy between the engine and the various machines would total up to a very large percentage, and that the system of electric drives would result in some economy in that respect. I do not profess to know anything about it, but I would like to ask if tests have been made in regard to the relative economy of these two systems in that respect, irrespective of the advantages of having overhead cranes, etc.

Henry Hess.—In point of power to be provided there is very little difference between individual motor and line shaft driving; the central power plant capacity need not exceed one-fourth to one-third the aggregate of the various motors. But motors must be selected with reference to the maximum power requirements of the tools, not their average; as a result the individual motors are worked at less than their normal capacity and are therefore used uneconomically; that means that the saving due to elimination of line shaft friction is lost by this necessary uneconomical use of motors, so that there is little real difference in power efficiency. Still, individual motor driving is advantageous particularly as concerns the larger tools, which can then be run overtime without idly driving long lines of shafting. In such cases the individual motor is very economical. Again, certain tools are better brought to the work than the work to the tools; this is the general practice in some of the large electrical concerns. Other tools, again, can be handled better with individual motors than with belts. The best arrangement for large shops is a grouping of smaller tools to be driven by short line shaft sections, each section having its own motor. Individual motors are used on the larger tools; on some of these several small motors are employed for various motions. My own practice has been to group all tools requiring less than 3 h. p. for belt driving and to use individual motors on all tools calling for 3 or more h. p. Naturally, this is not a hard and fast rule; tools otherwise coming under the first head may, by using individual motors, be placed at more advantageous locations where it would be awkward to use line shafts.

The President.—Such tests as Mr. Webb referred to have been made frequently, and have shown a decided saving in power when electric motors were used to replace shafting and belts. There is, however, a difference in different plants and it depends largely upon the nature of the plant how much more economical electricity will be. Each case must be considered by itself. As for what Mr. Hess said, I don't think he is quite right in saying that you replace the belt by an inefficient motor. I think most electric motors are far more efficient than the belts and shafting. In driving by belts there are generally several belts between the engine and the final power consuming machine, and the inefficiency has to be charged to the whole series of belts and shafting. As an illustration of a point raised by Mr. Barth, I would like to mention a case that came to my notice only a few days ago. It was a face lathe for objects of large diameter. By using a variable speed in making the cuts, you can increase the speed, in the exact proportion as the tool approaches the center, and in that way you can face off the plate in the minimum possible amount of time, because the cutting speed will then always be the same. That is only one illustration of the advantages of variable speed. Mr. Walker, in his paper, said that it would be still more desirable to have a constant torque at variable speeds. This is not consistent with having a constant horse power; if this is to be done, then it must not be expected that the motor has the same power at all speeds, because the power of the motor will of necessity have to increase as the speed increases. In any such system as that, the motor must, of course, be relatively very large for the power at the low speed, as it will then be running far below its possible power. The difficulty has been to get the *same horse power* out of the motor at the variable speed, not the same *torque*.

E. L. Walker.—One thing, in defense of the variable speed drive, which may be emphasized, is shown in the first curve (Fig. 1). The table shows a similar result except that it is

worked out for increase of feed; but the same principles would apply in regard to increase in speed. The first increase in speed will save a great deal more than any equal, subsequent increase in speed. A slight difference in speed cannot be accomplished between the steps of a cone pulley. With a variable speed motor this can be done, and I think a great deal of money is often lost by not increasing the speed only a very slight degree.

Pneumatic Tool Companies Consolidated.

The Philadelphia Pneumatic Tool Co. has issued the following statement:

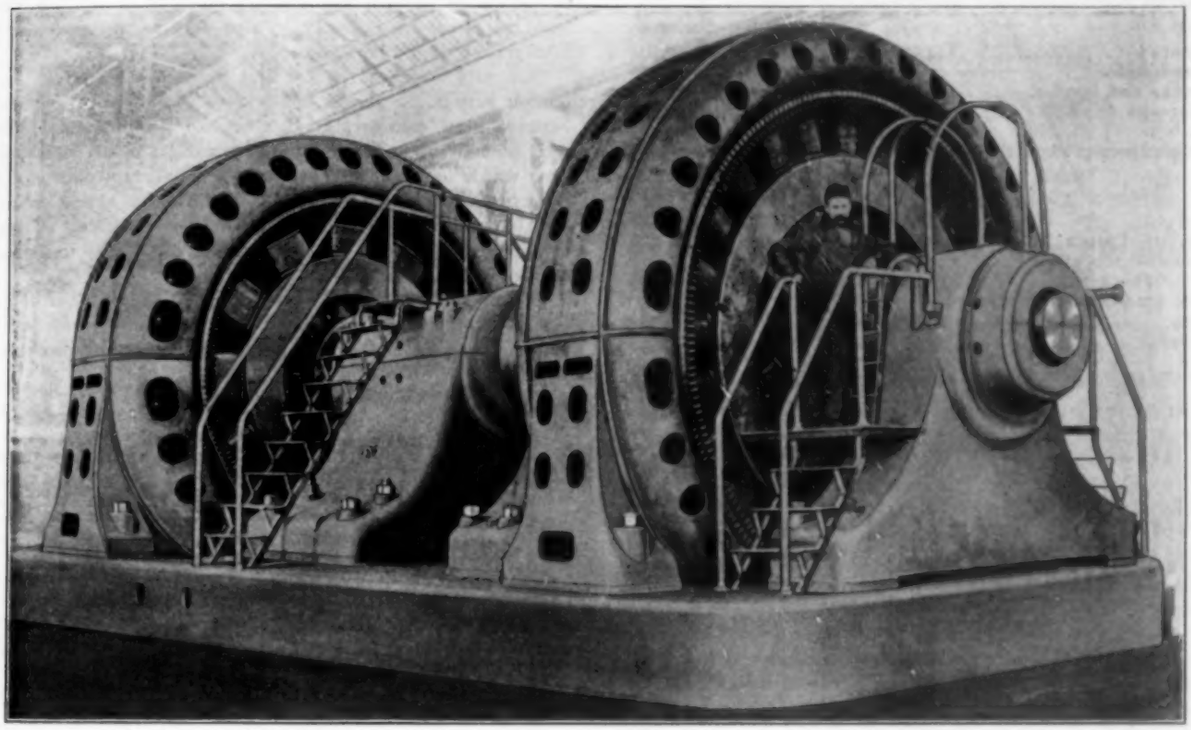
"The litigation which has been pending for some time between our company and the Chicago Pneumatic Tool Co. has resulted in decisions sustaining the patents of the Chicago company. As a result of these decisions, and after careful consideration of the patent situation, we have become convinced that pneumatic tools cannot be manufactured without infringing the patents of the Chicago company. We have therefore thought it best, both on our own account and for the purpose of protecting the users of Keller tools from expensive litigation, to assign all of our business, patents, trade marks and good will to the Chicago Pneumatic Tool Co. and to join interests with them. Arrangements have been made for continuing the manufacture of Keller tools."

Judge Wonty in the United States district court at Grand Rapids, Mich., has confirmed the sale of the Holt & Munson mill at Bay Mills, Mich., and other Hall & Munson properties in the upper peninsula to the Cleveland Cliffs Iron Co., of Cleveland. The bill of sale in the transaction includes all the plat and town-site land at Bay Mills, including the company's stores, houses, mills and machinery. It also includes 72,000 acres of timber land and 23,000 acres of farm land, all present contracts, good will, in fact everything that the Hall & Munson Co. in any way possesses. For these varied assets the Cleveland Cliffs Iron Co. is to pay $370,000. Although plans have not yet been fully outlined it is understood that it is the intention of the company to build a railway between Munising and Bay Mills, with a possible extension to the Soo.

THE LARGEST ELECTRIC MOTOR.

The Iron Trade Review had in the issue of Feb. 2 a description of the power plant at Shawinigan Falls and this account was accompanied with an illustration of the 10,500 h. p. turbine built by the I. P. Morris Co., of Philadelphia. This week we show the largest electric motor ever built and which is now being installed at the plant of the Shawinigan Water & Power Co., Shawinigan Falls, Quebec. This was recently constructed by the Allis-Chalmers Co. at its electrical works in Cincinnati, and embodies in its design the characteristics of the Bullock alternators, which have proven singularly successful in their application. It is a synchronous motor of 8,000 h. p. The rating of the generator operated by this motor, on standard specifications, is 5,750 k. w. at 300 r. p. m. The combined machines, in addition to their enormous capacity are remarkable for concentrating in an exceedingly small floor space a total of 12,000 k. w.

The photograph of the machines, which is here illustrated, was taken while they were being tested at the shops, by the Behrend system, under full load conditions corresponding to 7,200 k. w. on the generator, with the expenditure of no more than 300 k. w. in order to produce the same losses in the machine which exist under full load conditions.



AN 8,000-H. P. MOTOR BUILT BY THE ALLIS-CHALMERS CO.

The working of the generator and motor forming the frequency changer at Shawinigan Falls will be carefully noted by electrical engineers in all parts of the world, and if it is as successful as the builders confidently anticipate, the result will be a valuable addition to existing data on the subject of alternating current machinery.

The British steamer Tantalion has arrived in Philadelphia with a cargo of 4,000 tons of pig iron from Middlesborough, England, consigned to a Philadelphia firm to be used in the manufacture of cast iron water pipe and reshipped to England. United States Consul H. Clay Evans, London, reports that 3,150 tons of pig iron were shipped to the United States during December from Middlesborough.

RAILWAY STEEL SPRING CO.'S REPORT.

The Railway Steel Spring Co., in common with other industrial corporations, suffered from the reaction in business during the first half of last year, a fact that was brought out in the statement for the year ended Dec. 31, 1904, presented at the annual meeting held in Jersey City last week. Following are the figures submitted:

Surplus Dec. 31, 1903		$1,705,886
Less common dividend		269,988
Balance		$1,435,898
Net earnings for 1904	$1,089,043	
Less preferred dividend	944,970	
Surplus for year		144,973
Profit and loss surplus Dec. 31, 1904		$1,580,871

The balance sheet, as of Dec. 31, with comparisons with the previous year, follows:

ASSETS.

	1904.	1903.	Changes.
Plants	$24,534,215	$24,437,511	+$ 96,704
Merchandise	826,520	1,216,761	— 390,241
Stocks and bonds	259,102	241,906	+ 17,196
Accounts receivable	1,056,568	1,452,866	— 396,298
Cash	2,180,808	1,558,041	+ 622,767
Other items	32,671	48,724	— 16,053
Total	$28,889,884	$28,955,810	—$ 65,726

LIABILITIES.

Preferred stock	$13,500,000	$13,500,000	.....
Common stock	13,500,000	13,500,000	.....
Accounts payable	194,164	119,315	+$ 74,849
Res. for pfd. stk div., taxes etc.	114,849	130,609	— 15,760
Surplus	1,580,871	1,705,886	— 125,015
Total	$28,889,884	$28,955,810	—$ 65,726

At the meeting a resolution was adopted reducing the number of directors from fifteen to eleven, and the following were elected: Julius E. French, W. H. Silverthorn, Charles Scott Jr., Frank S. Laying, S. L. Schoonmaker, Frank Q. Barstow, Philo N. French, Charles Miller, James W. Fuller, Charles W. Barnum and William M. Barnum. The directors who retired as a result of the reduction in the board are: James C. Peach, T. H. Newberry, M. B. Parker and Charles Scott. The vacancy caused by the death of Samuel R. Callaway was filled by the election of Wm. M. Barnum.

The new board declared a dividend of 2 percent on the common stock, payable April 3. Books close March 23 and reopen April 4. This is the second dividend declared by the company, the first one of 2 percent having been paid in April, 1904.

Notwithstanding the poor results of 1904, officials of the company are cheerful as to the future, basing their views upon the current activity in the iron and steel trade.

American Radiator Co.'s Report.

President Clarence M. Woolley, of the American Radiator Co., in his annual report to the stockholders submitted at the annual meeting held at Orange, N. J., March 1, shows that the company had the largest year in its history both as regards net profits and volume of business. There is a surplus after dividends of $445,000, or $114,400 in excess of the previous year, notwithstanding the fact that dividend disbursements were larger owing to the initial payment on the common stock.

The income account for the fiscal year ended Jan. 31, 1905, follows:

	1905.	1904.	Increase.
Net profits	$703,930	$540,518	$163,412
Less dividends, preferred stock	210,000	210,000	.....
Common stock	48,930	.....	48,930
Balance	$445,000	$330,518	$114,482

Mr. Woolley says: "The policy of deferring the payment of dividends on the common stock, in spite of generous earnings each year, until a substantial surplus had been reserved enables this company to present a very strong balance sheet. It shows that the surplus is equal to over 80 percent of its preferred capital, while the quick assets are over 90 percent of the preferred capital. The company began the payment of common stock dividends in November last at the rate of 4 percent per annum. We entered the present fiscal year with our inventories adjusted upon the basis of prices then existing, which imposed a heavy burden upon the earnings of the preceding fiscal year, in absorbing the great shrinkage in values which had occurred. The profits, therefore, for the fiscal year just closed are quite consistent with the volume of business secured and express the earning capacity of the company under more favorable conditions than were recorded the preceding year.

"The demand for our products comes from three sources: First—The construction of new buildings. Second—The introduction of modern and sanitary methods of heating into buildings already in existence. Third—The reconstruction and modernizing of old buildings.

"The field embraced by the first mentioned played an important part in the results which were accomplished, but our business grew considerably in excess of the increase in the total amount of building permits issued. The persistent efforts which we have made to secure a broader introduction of other products into old buildings, a field which is almost unlimited, have met with a larger result than ever before. A new manufacturing plant has been completed and is now in partial operation at Litchfield, Ill."

The president's report further explains that the foreign business continues to grow and that the plants which were built in Germany and France are doing a large and profitable business.

The balance sheet as of Jan. 31 follows:

ASSETS.

	1905.	1904.	Increase.
Real estate, plants, assets, etc	$ 7,337,438	$ 7,353,963	*$16,525
Additions during year	363,416	83,475	279,941
Total	$ 7,700,854	$ 7,437,438	$263,416
Less depreciation	100,000	100,000	.....
Net property	$ 7,600,854	$ 7,337,438	$263,416
Cash	252,364	229,046	23,318
Notes received	16,160	22,064	*5,904
Accounts received	1,820,145	1,728,284	91,861
Raw material, finished products, etc.	1,314,625	949,191	365,434
Total	$11,004,148	$10,266,023	$738,125

LIABILITIES.

Preferred stock	$ 3,000,000	$ 3,000,000	.....
Common stock	4,893,000	4,893,000	.....
Accts. and bills payable	609,262	316,137	$293,125
Profit and loss sur	2,501,886	2,056,886	445,000
Total	$11,004,148	$10,266,023	$738,125

*Decrease.

Following is a statement of quick assets and liabilities on Jan. 31:

	1905.	1904.	Increase.
Total quick assets	$3,403,295	$2,928,585	$474,710
Less all accts. and bills payable	609,262	316,137	293,125
Net quick assets	$2,794,033	$2,612,448	$181,585

James B. Forgan, of Chicago; Henry Bond, of Chicago, and James B. Dill, of East Orange, were re-elected directors.

On the petition of George Wybel, C. O. Kerstetter has been appointed receiver for the Summit City Machine Co., Akron, Ohio.

PERSONAL.

The Kempsmith Mfg. Co., Milwaukee, Wis., has recently engaged the services of Louis Thiel, Cincinnati, O., a well known milling machine expert.

B. A. Schroder, for some time attached to the St. Louis office of the Crocker-Wheeler Co., has been placed in charge of the New Orleans office of the company. Mr. Schroder succeeds W. P. Field, who has been transferred to the Boston office.

At the annual meeting of the stockholders of the Chapman Valve Mfg. Co., Indian Orchard, Mass., held recently, Supt. C. J. Winther resigned as a member of the board of directors and was succeeded by George B. Holbrook. Edwin McElwain was elected a director to fill the vacancy caused by the death of Julius H. Appleton. The following officers were elected: President, James D. Safford; clerk and treasurer, H. R. Dalton Jr.

M. E. Gray, of the Mexican Furnace Co., which has its headquarters in Mexico City, has been in the United States recently purchasing wood and iron working machinery. Improvements on the plant are being made at a cost of $100,000.

W. H. B. Ward, superintendent of the Struthers sheet mill of the American Sheet Steel Co., has resigned.

B. L. Keene, formerly with J. B. & J. M. Cornell, New York, is now superintendent of the Stirling Co., Barberton, O.

James S. Stirling, who was recently elected president of the Crescent Shipyard Corporation and of the S. L. Moore & Sons Corporation, subsidiary companies of the Bethlehem Steel Corporation, has risen rapidly during his business career. Mr. Stirling, who is not yet 34 years old, entered the cost department of the Harlan & Hollingsworth Co. in 1891, and in 1892 was made superintendent of the foundry department. In January, 1903, he became vice commissioner of the National Founders' Association. He continued in that position until he resigned to become associated with the S. L. Moore & Sons Corporation. Mr. Stirling was vice president for three years of the Philadelphia Foundrymen's Association and was a member of the third district committee of the National Founders' Association during 1901 and 1902.

Edgar N. Dickson, office manager and general purchasing agent of the Allis-Chalmers Co., Milwaukee, has resigned to become associated with the Milwaukee Coke & Gas Co.

W. B. Sandford, and son, W. E. Sandford, who have been connected with the Western Tube Co., of Kewanee, Ill., have resigned to become superintendent and assistant superintendent respectively of the Mark Mfg. Co.'s pipe mill at Zanesville, O.

Julian Kennedy and Durbin Horne have been appointed members of the board of trustees of the Carnegie Institute to succeed T. M. Carnegie and Henry Phipps, recently resigned.

B. F. Harper, formerly special agent for the Carnegie Steel Co. at Pittsburg, will assist John R. Scott, manager of sales for the Cleveland district.

Frederick A. Flather has accepted the treasurership of the Boott Mills at Lowell, Mass. The company operates 150,000 spindles. It was one of the first to undertake the manufacture of cotton goods in this country and today is one of the largest. Mr. Flather has been in Chicago for some years, first in charge of the McCormick Reaper Works, and since the formation of the International Harvester Co. as manager of all of its works in Chicago and other parts of the country. He will sever his connection with the International Harvester Co. on March 15, and at once take up his new duties at the Boston office of the Boott Mills.

Herring-Hall-Marvin Safe Co. Plans.

A plan for the reorganization of the Herring-Hall-Marvin Safe Co. has been prepared by a committee consisting of Otto T. Barnard, J. Edward Studley and Henry C. Ahern. It is proposed to create a new company to be called the Herring-Hall-Marvin Safe & Vault Co., to have $700,000 of stock, all common. This is to be issued for existing stock as follows: First preferred, share for share, $513,721; second preferred, 500 shares of new for each $3,000 of old, $144,542.83; common, 100 shares of new for each $3,000 of old, making $43,405. This totals $701,668,83 of new for the $2,683,128 of the old securities, but it is proposed to purchase and cancel the small amount over the $700,000. The time for the deposit of the old stock under this plan is March 25. The reason for the reorganization is stated as follows by the committee: "The net earnings for the past year were $35,000, and although your committee believes that the earnings should and may become more than double that amount the present capitalization is beyond the probability of dividends within any reasonable period except for the first preferred, and is prejudicial to the interests of the company." As soon as all the stock is deposited under the reorganization plan the committee is authorized to sell the assets of the present company to the new company and dissolve the former. It is then proposed that the new company fund the floating debt and provide for additional working capital by issuing debenture or mortgage bonds as may be deemed advisable.

Empire Steel & Iron Co.'s Report.

The report of the Empire Steel & Iron Co. for the year ended Dec. 31 shows net earnings of $88,155, against $249,357 in 1903. After deducting $75,000 for preferred dividends, a surplus of $13,155 was left. For improvements $47,000 was set aside. President Leonard Peckitt says: "The production of pig iron was 163,202 tons, or 82,311 less than the output of the furnaces for 1903. We mixed and shipped during the year 111,375 tons of ore from the Oxford and Mount Hope properties in New Jersey, and although the tonnage was somewhat larger than the previous year, the output could have been considerably increased. Unfortunately the iron market from the beginning of the year until well into the autumn months was far from active, and the business was so unprofitable that several of the furnaces were closed, therefore necessitating a further restriction of output of the ore mines. Although fully covered by contracts for more than enough coke to run us 'full blast' up to the end of the year, the shippers of this material at the first sign of improvement, in practically every instance, failed absolutely to deliver anything like the tonnage we were entitled to receive, and consequently we were obliged to 'slow down' during the entire last quarter of the year, which, of course, meant decreased outputs of iron and heavy losses that otherwise must have been profits in the business."

Pennsylvania Railroad Co. to Spend $75,000,000.

The Pennsylvania Railroad Co. will spend $75,000,000 for construction and equipment this year. The list of improvements to be made and supplies to be purchased this year was approved by the road committee of the board of directors at Philadelphia on March 6. This year's appropriations exceed by nearly $25,000,000 the money expended on the same account last year.

Concerning the report, which has been widely circulated by Eastern newspapers, that M. A. Hanna & Co. have booked an order for 300,000 tons of pig iron for use in making castings for the East River tunnel of the Pennsylvania railroad, we are officially advised that the firm has not sold any iron for tunnel castings since the sales made six or eight months ago, which were recorded by *The Iron Trade Review* at that time.

The blooming mill of the Donora plant of the Carnegie Steel Co., Pittsburg, was placed in operation last week. Four of the twelve open hearth furnaces are now in operation and as soon as the blooming mill tonnage increases the remaining furnaces will be started.

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EXPORTS STILL DECREASING.

The export movement has apparently spent its force. Although the exports for January last of articles on which tonnage is reported were 7,000 tons in excess of those of January, 1904, the exports for last January were almost 18,000 tons less than those of the preceding month, December, 1904, and 72,000 tons less than those of November. This rapid decline is due largely to cessation of exporting of rails and crude steel. In January, there were only 12,232 tons of rails exported. British North America and Japan, which have been liberal buyers, have almost stopped placing orders, as only 121 tons were shipped to our Northern neighbors, while not a single ton is credited to the fighting Japs. Exports of billet, ingots and blooms have declined from 18,162 tons last December to 8,981 in January. The most important increase was in pig iron, the exports in December having been 3,141 tons and in January 10,451, a rather unexpected development for a time of advancing prices. The tonnage table of exports named follows:

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES—GROSS TONS.

	January		7 mos. end'g Jan.	
	1904	1905	1904	1905
Pig iron	6,742	10,458	19,666	37,770
Scrap	1,902	471	7,630	16,139
Bar iron	2,000	3,822	9,276	18,010
Wire rods	306	2	8,413	12,400
Steel bars	1,035	1,427	9,269	14,109
Billets, ingots and blooms	17,184	8,981	21,977	151,137
Hoop, band or scroll iron	196	286	1,201	1,887
Iron rails	605	.....	740	27
Steel rails	4,960	12,232	31,512	292,735
Iron sheets and plates	204	374	3,738	2,615
Steel sheets and plates	1,423	2,874	7,484	40,331
Tin plates, terne plates and taggers' tin	122	587	251	4,993
Structural material	2,340	3,780	17,021	38,091
Wire	7,583	8,307	61,986	67,466
Cut nails	788	398	5,671	4,975
Wire nails	2,316	2,513	19,930	20,483
Other nails, including tacks	170	389	1,360	2,093
Total	49,876	56,898	227,126	725,231

The value of exports of iron and steel, not including ore, but including articles on which tonnage is not reported, was, for January, $8,957,989 against $8,171,738 in the same month of 1904; for the seven months ending with January, $76,517,058 in 1905 against $59,125,780 in 1904. The exports of ore were 885 tons in January, 1905, against none in the same month of 1904. For the seven months, the ore exports were 207,131 tons in 1905 and 75,385 tons in 1904.

The imports for January show an increase of 6,632 over December and a decrease of 2,857 tons compared with January, 1904. Imports of pig iron show an increase of 3,000 tons, but the tonnage for January is not important, being only 8,804. The tonnage table follows:

IMPORTS OF IRON AND STEEL TO THE UNITED STATES—GROSS TONS.

	January		7 mos. ending Jan.	
	1904	1905	1904	1905
Pig iron	10,812	8,804	157,935	44,292
Scrap	827	1,370	20,881	6,251
Bar iron	2,781	1,739	23,542	12,648
Iron and steel rails	1,740	967	24,651	7,996
Hoop, band or scroll	634	395	1,496	1,562
Steel ingots, slabs, billets or bars	1,860	1,364	87,188	5,557
Sheets and plates	748	202	7,956	1,242
Tin and terne plates	5,432	7,909	27,314	22,359
Wire rods	1,319	1,430	11,751	8,655
Wire and wire articles	450	326	3,185	2,063
Structural shapes	541	81	9,406	1,839
Total	27,144	24,287	375,305	114,464

The value of imports included in the table and of others of which tonnage is not reported, was: January, 1905, $2,110,815, against $1,959,132 in January, 1904; for the seven months, $12,640,588 for 1905 and $17,895,247 for 1904. The iron ore imports in January were 46,620 tons against 29,594 in January, 1904. For the seven months ending January last, the ore imports were 371,057 tons against 550,544 tons for the seven months ending January, 1904.

THE STRENGTH OF PUBLICITY.

In the railroad rate legislation now pending in Congress, and in possible or prospective legislation relating to the trusts, the aim is to seek remedies beyond that of publicity. Yet the very business interests whose alleged encroachments upon the rights of others the Presidential party desires to restrain could give ample evidence upon the value of publicity alone as a preventive measure. The business world is full of arrangements, some formal and some of the most informal nature, whereby information is disseminated and the most important results achieved in preventing price cutting and other concessions. In the steel trade the billet, plate, steel bar and other associations illustrate the benefits of even a limited publicity. By a simple system of reports each party to the agreement is advised at regular intervals of all sales that have been made in the trade, with the terms, so that each may know exactly what is being done and how much truth there may be in various representations which are made by buyers. The history of the present billet association furnishes excellent proof of the effectiveness of these publicity methods. Just prior to the establishment of its report system the trade was filled with claims of various cuts and concessions, all of which claims were disquieting and had a tendency to create the very condition which in many cases they falsely reported to exist. In this and in other cases

abuses have been corrected by the simple means of publicity.

It is fitting that the Federal government, in its desire to accomplish certain results, should profit by the clear experience of those upon whose methods it desires to exert an influence. However, in its own experience, it has evidence of the success of publicity measures in the working of the interstate commerce law. In depreciation of the value of this law the argument has been advanced that in the eighteen years of its existence its aid has been invoked but a very few times. No argument could be more absurd. The efficiency of laws against murder is not to be tested by the multitude of convictions, but by the smallness of the number of murders.

The interstate commerce law achieved immediate results because the abuses had been thoroughly aired and the issue was clear cut as being a matter of rates. In a larger field, the Department of Commerce and Labor has duties the same, in essence, as those of the Interstate Commerce Commission, but these duties are not so clear cut. The department in a large measure must classify and define its duties. It deals, moreover, with a class of interests from which the Federal government has no right to demand as much as it can from the railroads, inasmuch as the right of eminent domain constitutes an extremely valuable privilege which the people could have withheld if they desired. It is not common to all countries.

It is only fair, therefore, that judgment should not be exercised too hastily as to what the Department of Commerce and Labor may ultimately succeed in accomplishing, and that the great force of publicity as a corrective and preventive measure should not be lightly regarded. That it is mild and not spectacular in its action shows that its strength is fundamental.

THE THREADING OF WROUGHT PIPE.

The article by Frank N. Speller, metallurgist of the National Tube Co., in *The Iron Trade Review* of March 2, presents some suggestive tests of corrosion in wrought pipe, but it is even more interesting in the closing paragraphs discussing threading. It is probable that the taper on threaded pipe has led to a condition that would not be tolerated in any other shop operation. Threads of uneven contour, rough and broken surfaces, have nevertheless "made up" into tight connections, a liberal use of "dope" and muscle, bringing the tapered surfaces into sufficient contact to prevent leakage. The effect of this severe strain on the pipe sections when forcing the joints together is to weaken the walls of the tube and under pressure seams are apt to split open along the surface.

That a die should have suitable rake on the chasers would seem to be as evident as that a lathe tool ought to cut rather than scrape the metal away. A solid die, however, is not so easily and quickly sharpened as the average lathe tool, and this fact has probably had much to do with the blunt angles of the chasers in threading dies. At a recent meeting of engineers considerable time was devoted to pipe joints in heating apparatus but little attention was given to threads and chasers, the discussion centering about the choice of the particular lubricant or cement best adapted to sealing the pipe connections.

Recent utterances by men of much experience show their appreciation of current misapprehension of the true situation. Mr. James Hartness of the Jones & Lamson Machine Co., in an essay on the evolution of the machine shop, shows that the cutting edge of a knife will not last long if it is used for scraping the surface of a stick but it will last in whittling because there is no scrape across the edge. Perhaps a further illustration of the point is found in the common steel eraser, usually employed as a scraper. The edges are sharply beveled at one side, and if the eraser is used to cut in one direction, say away from the operator, the cutting edge of the blade is preserved and the paper chips curl up in tiny rolls illustrating the defference between the cut and the scrape. Similarily the chasers made for a shaving rather than a dragging operation in threading pipe would stand up to their work and give better results for a longer life, and on the other hand the lessened strain on the pipe necessary for tight connections would have manifest advantages.

The peculiar angle the point of the cutters should have for greatest efficiency may be influenced by the lessons high speed steel is teaching. Dr. Nicolson shows that the greatest pressure in a lathe tool is not at the extreme point of the tool where the metal is first separated but some distance back from the point where the shavings curl up. Here a groove is worn and as this increases and reaches the point of the tool the latter fails. Provision should therefore be made for getting the metal away in shavings with curves of large radii or by so designing the cutting tools that there is a free space at the rear of the cutter for the chips to pass easily away from the work.

During the months of January and February all records for new business were broken by the Westinghouse Electric & Mfg. Co., Pittsburg. In the steam turbine department orders for over 100,000 h. p. were closed while the orders for steam and gas engines and stokers have been exceedingly heavy. Owing to the demand for turbines of large capacity it has been decided to increase the boiler capacity of the plant 5,000 h. p. so that turbines up to 12,000 h. p. can be tested. Among the recent large orders placed for turbines are the following: Indian Electric Co., Indian Harbor, Mass.; Gray Mfg. Co., Gastonia, N. C.; Henrietta Mills, Henrietta, N. C.; Grace Harbor Electric Co., Grace Harbor, Wash.; Rhode Island Co., Providence, R. I.; Philadelphia Rapid Transit Co., Philadelphia.

The 33-in. blooming mill which the United Engineering & Foundry Co. installed at the New Castle plant of the Carnegie Steel Co., recently rolled 2,050 tons of 6½ x 7½ sheet bar blooms during a turn of twelve hours. This is a record for a mill of this size and since its installation the steel works has been unable to supply sufficient steel to keep it in continuous operation.

The Labor Situation.

MEETING OF NINTH DISTRICT N. M. T. A.

A meeting of the ninth district of the National Metal Trades Association was held in Cleveland, Saturday, March 4. The members assembled at the Chamber of Commerce Club, where they were the guests at luncheon of W. B. Cowles, chairman of the district. The following officers were elected for the ensuing year: Chairman, W. B. Cowles, Long Arm System Co., Cleveland; vice chairman, George Bartol, Otis Steel Co., Cleveland, who, with the following, constitute the members of the district committee: L. A. Woodard, the Wm. Tod Co., Youngstown; J. E. Brown, the Aultman & Taylor Machinery Co., Mansfield, O.; J. N. Ricard, the Ricard Boiler & Engine Co., Toledo, O.

W. P. Eagan, commissioner, and Robert Wuest, secretary, were present and addressed the meeting. Mr. Eagan emphasized the importance of having a large attendance at the convention of the National Metal Trades Association, which will be held at the Auditorium Hotel, Chicago, March 23 and 24. He said that at that time the plan and scope committee would submit a report which would be of vital importance to the association. It would deal with the relations of the national association to the local organizations. Mr. Eagan said that he believed in local organizations, but he emphasized the importance of the national organization. Referring to the recent prolonged strike of machinists in Chicago, Mr. Eagan gave a most interesting account of what the national association had done. He said that the expense of fighting the strike to members of the national association was only one-twentieth of the expense of that to members of the local Chicago organization, the majority of whom did not belong to the national organization. He described the methods of labor unions in conducting strikes, showing how they are effective because of the moral and financial support of large numbers of men in all parts of the country. He declared that for the manufacturers to attempt to oppose great national organizations of labor by local organizations alone would be dangerous and expensive. He said that in paying money to a national organization, it was not a question of getting back what you paid in. That is, any manufacturer would prefer not to have money expended on a strike in his plant. Mr. Eagan spoke of one member of the national organization who had freely contributed, saying that he never had had a strike and hoped he never would have one, but he was willing to help pay the expense of opposing strikes in other people's plants. Referring to the results of the Chicago strike, Mr. Eagan said that one manufacturer had recently told him that he had just shipped to France complete equipment for a plant which was the best job ever turned out by the company and it was done at 20 percent reduced cost, in spite of the fact that the machinery was built during the strike period, and that many of the men employed were newcomers.

Mr. Wuest gave some reminiscences of the Chicago strike, and spoke of the growing popularity of the N. M. T. A. certificate of recommendation issued to competent workmen. He said that during the strike in Chicago many men who had these certificates had voluntarily come long distances in order to help fight the strike. Great care is exercised in granting these certificates, and only men of high character and marked skill can obtain them. Mr. Wuest also spoke of the success of the Foremen's Club in Chicago, which he was instrumental in organizing. The addresses of Messrs. Eagan and Wuest were heartily applauded, and a general discussion followed, the principal question being the relation of local organizations to the national association. Nearly all present announced their intention to attend the coming convention. The following members and officers were present:

W. P. Eagan, Cincinnati.
Robert Wuest, Cincinnati.
F. Alton Pope, Buckeye Engine Co., Salem, O.
L. P. Thompson, traveling representative, N. M. T. A.
C. R. Diebold, Long Arm System Co., Cleveland.
George Bartol, Otis Steel Co., Cleveland.
W. J. Clark, W. J. Clark Co., Salem, O.
W. B. Cowles, Long Arm System Co., Cleveland.
John S. Oram, J. S. Oram Co., Cleveland.
Joseph Champ, Babcock-Bishop Co., Cleveland.
J. H. Webster, Variety Iron Works, Cleveland.
Geo. O. Cromwell, American Machine & Mfg. Co., Cleveland.

The following were guests:

M. J. O'Donnel, M. J. O'Donnell & Co., Cleveland.
W. A. Dutton, Van Dorn & Dutton, Cleveland.
Frederick Metcalf, Chase Machine Co., Cleveland.
George Smart, *The Iron Trade Review*, Cleveland.

METAL TRADES ASSOCIATION.

Cincinnati, March 7.—The annual meeting of the Chicago Metal Trades Association will be held on Wednesday, March 15, at the Sherman House. The meeting will be preceded by a dinner.

The members of the Philadelphia Metal Manufacturers' Association announce their annual meeting and dinner at the Manufacturers' Club March 9.

The strike at the plant of the Scott Mfg. Co., at Keokuk, Ia., is still on, but the shop is running with a larger force of men than when the trouble began, and the company claims the output per man is larger than before.

At the meeting of the seventh district of the National Metal Trades Association a resolution was adopted requesting that the report of the Plan and Scope Committee be printed and placed in the hands of all members of the association not less than one week prior to the convention. Commissioner W. P. Eagan immediately submitted a copy of the resolution to the members of the administrative council, who concurred in the request and ordered that the report be printed and distributed as suggested. This report is the plan to be submitted to the convention for co-operation between local associations and the national organization.

LABOR NOTES.

At a meeting between the officers of the Amalgamated Association and the officials of the Whitaker-Glessner Co., held at Wheeling, W. Va., last week, no agreement was reached for a settlement of the strike now on at the company's palnts at Wheeling and Martin's Ferry. The men are still out and no date has yet been set for holding another conference.

The International Association of Blast Furnace Workers is again preparing to make a demand for an eight-hour day. It need hardly be said that this demand will not be granted, but it is probable the wages of the workers will be advanced by the furnace operators on April 1.

One hundred Austrians and Hungarians, formerly employes of the Illinois Steel Co. and the South Deering works of the International Harvester Co., have left South Chicago as a result of an influx of negro labor. It is predicted that 4,000 foreigners will leave for the old country for the same cause within a year. A farewell meeting for the one hundred was held a few evenings since. The men talked in their native tongue, and said that the negroes would displace all the foreign labor in the steel mills and other manufacturing plants. Employers are said to be well satisfied with the negro labor.

Judge Cochran, of the Federal Court at Covington, Ky., has ordered the Newport Foundry & Machine Co. to pay all the costs of its suit against the Iron Molders' Union of North America. Recently the case was dismissed because the foundry had been sold to the strikers and cause for action no longer existed.

Machine molders employed by the National Malleable Castings Co., Sharon, Pa., have received a voluntary advance in wages.

Fire starting in the machine shop of the Pennsylvania railroad at Ashtabula, O., March 7, extended to the roundhouse, which was destroyed. The loss was about $20,000.

CAR WHEEL CONSTRUCTION.

At a meeting of the Mechanical and Engineering Section of the Franklin Institute, Samuel M. Vauclain, superintendent of the Baldwin Locomotive Works, read a paper on rolled steel car wheels. This paper is presented with the discussion in a recent issue of the *Journal*. Mr. Vauclain shows that the loads on the wheels have increased from 50 to 100 percent and it has been impossible to increase the weight of the wheel in like ratio because the limiting factors, frogs, switches, etc., were fixed before the 100,000 lb. capacity car came into use. The chilled iron wheel is distinctively an American product and there is reason for pride in the achievement made in its development. Careful design and judicious selection of the molds and casting methods have accomplished much. The brittleness of the flange, inability to withstand the heating effect of the brake shoe, shelly treads producing flat spots, and the internal stresses induced in the casting of such a wheel have created a demand for a wheel free from these objections. Steel tired wheels with both spoke and plate centers have been introduced. Steel tired wheels of many designs have been made, the centers of cast iron, cast steel and wrought iron, and of both plate and spoke forms. In making wrought iron spoke centers, the spokes are made by bending pieces of iron in triangular forms. There are fitted into a ring, the hub filled with iron, and the wheel heated and hammered under dies. Mr. Vauclain proceeded to describe the rolled wheel made at the plant of C. T. Schoen, near Pittsburg, and which was the subject of an extensive article in *The Iron Trade Review* of May 5 and 12, 1904.

During the discussion G. H. Clamer said: "Perhaps few of us, not directly connected with the operation of rolling stock, realize the large proportion of railroad wrecks directly due to broken flanges. In former years when the equipment was light, speeds not so great, the cast-iron wheel did good service, but with the advent of the 100,000-lb. capacity car, the cast-iron wheel, as formerly made, was found to be inadequate for the service. The old design of wheel was transformed, the flanges made as thick as possible, etc., but even so, they were found wanting. A steel wheel, forged directly from the solid ingot, at least theoretically, presents the best kind of structure for the service. It is only a question of producing a wheel of this kind at a satisfactory price, and to show that it will compare favorably in operating cost with wheels now on the market, to create a great field for it. Mr. Vauclain has shown that although the steel wheels are softer than chilled cast iron wheels, nevertheless, the rate of wear is very much slower. The same holds good on bearing metals. It has long been the prevailing idea that it was necessary to have a hard bearing to resist wear, but that such is not the case has been amply proven by the fact that additions of large percentages of lead to the former copper and tin alloy have led to far better results, in not only anti-frictional but in wearing qualities. This fact was first brought out by Dr. Dudley, who made long series of tests fifteen or twenty years ago, in which he compared in actual service the wearing properties of copper and tin and copper, tin and lead alloys, with varying percentages of the different metals. Without going into the details of these experiments, suffice it to say, the following general conclusions were reached: The lower the content of tin, the slower the rate of wear. The higher the content of lead, the slower the rate of wear. We know that tin added to copper greatly increases its hardness, but it will be seen that both these conclusions have been drawn from alloys which were softer than the one which had hitherto been used as standard, viz: copper and tin, with 10 percent tin. If hard metal is used for bearings or car wheels, whichever it may be, the effect due to abrasion is, the particles instead of being elongated are flattened out before being worn off, and are simply broken down and split off at a rapid rate."

Prof. A. E. Outerbridge asked if any comparative tests have ever been made of the difference in rolling friction on the rail between steel wheels and chilled cast-iron wheels. "I remember a case in point which happened a number of years ago. A coal mine located in a mountainous district was equipped with coal cars, carrying perhaps 10 tons each; these cars were drawn up grade to the mouth of the mine by the mine locomotives, and then ran by gravity down the mountain. The system of braking was very crude, simply 'choking' and 'skidding' a sufficient number of the spoke wheels, which were chilled cast iron. The number of wheels which cracked, especially in cold weather, caused by heating due to the skidding, induced the proprietors to experiment with cast-steel wheels in place of chilled cast-iron wheels. They found, greatly to their surprise, that the mine locomotives could not pull as many loaded cars up the incline when equipped with cast-steel wheels as they did with chilled wheels, all other conditions remaining the same, and this was attributed to the difference in friction between the wheels and the rail. The company decided not to adopt cast-steel wheels. My recollection is that a locomotive pulled twenty-eight loaded cars equipped with chilled cast-iron wheels out of the mine without difficulty, and could barely pull twenty-six precisely similar cars equipped with cast-steel wheels, though I do not vouch for the exactness of these figures. A difference of 10 percent in hauling capacity of a locomotive, due to difference in rolling friction between steel wheels and chilled cast-iron wheels and the rail, would be a serious matter in freight-car service. I am of the impression that it is an established fact that the brakes grip a steel wheel more tightly than they do a chilled cast-iron wheel at equal pressures, due to difference in friction."

J. S. Whitney asked the weight of a 33-in. rolled steel wheel designed for same service as a 600-lb. 33-in. cast chilled wheel and Mr. Vauclain replied "About 675 lbs."

Mr. Whitney: "The wear of the *tread* of a well chilled cast-iron wheel is due to the action of the break, which in time removes the surface, and if the metal is not of proper quality, causes 'shelling out.' The rolling of the tread over the rail does not cause wear, unless there is not sufficient depth of chill, or the chill is too soft. But the wear of the *flange*, which is more important as to safety, is due to the friction of the side of the flange against the side of the rail, which reduces the thickness, and tends to breakage. As the steel tire must be of the same quality throughout, and can be no harder than is consistent with strength, while the chilled wheel can be made hard on tread and flange while the body of the wheel is soft and strong, it has always been found that the flange wear is greater in the tire than in the wheel, under same conditions. This, of course, makes necessary several re-turnings of tire, to form new flange. What is the experience with the rolled-steel wheel, having, as Mr. Vauclain says, an almost uniform chemical analysis?"

Mr. Vauclain: "A consideration of the various resistances which a locomotive overcomes in hauling a train will at once show that the rolling friction of the wheel plays but a minor part in the total resistance of the train. The total resistance is composed of that due to head of wind, to journal friction, to curvature, to acceleration or overcoming the inertia of the train, and to the grade, which is usually greater than all the others combined. The resistance due to these items is all independent of the rolling resistance of the wheel. In designing engines no attention is paid to whether the cars of the train are to be equipped with chilled iron or steel-tired wheels, and an extensive series of experiments which I made upon train resistance as well as those made by various railroad companies have failed to show any difference in drawbar pull of a train equipped with steel-tired and chilled-iron wheels respectively. The wear of the flange is usually greater than that of the tread, because in the former case there is sliding as well as rolling friction, whereas in the latter there is rolling friction only and the abrasive effect of the former is much

greater than the latter. While the rolled wheel is of a uniform analysis the strength increases with the hardness. The ductility, however, decreases with the hardness, but no matter how hard the wheel be made, its ductility will always be greater than that of a chilled-iron wheel. The physical tests which I have made show this clearly, giving a tensile strength of 120,000 lb. per sq. in. against 35,000 lb. per sq. in. for a chilled-iron wheel. The flange wear of rolled wheels is the same as that of a steel-tired wheel, which is generally recognized to be less than that of chilled-iron wheels. In opening the discussion Mr. Clamer has clearly shown that a good wearing metal is not necessarily a hard one, and I have known tires to wear rapidly not because they were too soft, but because they were too hard."

THE GAYLEY DRY AIR BLAST.

At the New York meeting of the Iron and Steel Institute on Oct. 27, 1904, First Vice President James Gayley, of the United States Steel Corporation, replied briefly to the discussion on his paper entitled "Application of Dry Air Blast to the Manufacture of Iron." The last volume of the transactions of the Iron and Steel Institute, recently published, gives Mr. Gayley's revised and extended reply as follows:

Referring to the questions asked as to the saving obtained by the dry air blast process, it has been found, as a result of several tests, that the saving in horse power in the blowing engine room practically compensates for the expense of operating the dry blast plant. There is a saving in coke, labor, supplies and general expenses, in the limestone corresponding to the coke saved, which would otherwise have been needed for fluxing the ash, a reduction of phosphorus in the metal corresponding to the reduction in coke consumption, which is of some importance in the making of Bessemer pig, and where fine ores are used there is less waste of ore through furnace gases. In addition to this there is increased earning capacity for the plant through increased output.

It has transpired that certain statements made in the paper have been misunderstood, and I take this opportunity to shed further light, if possible, on some of them. First, with regard to the density of the blast: Some erroneous calculations might be made from the data showing the air entering the refrigerating chamber at about 80 degrees and leaving it at about 25 degrees, since the dry air in passing through the main from the refrigerator to the blowing engines is increased in temperature to 35 degrees F. From a careful indicating of the engines it has been found that there is 8.2 percent less weight of air entering the furnace than has been used prior to the introduction of the dry blast. Next, with regard to the moisture contained in the atmosphere: It has been assumed to be a matter of common knowledge that the moisture in the air is contained as aqueous vapor, and when passed through the stoves becomes superheated steam, and whether the moisture entering the furnace as superheated steam with the blast, or as water from a leaking tuyere which is at once converted into superheated steam, it is nevertheless a form of water, and that it must be dissociated by the fuel and heat absorbed; but inasmuch as there is superheated steam to deal with at one end of the process, and frost or snow at the other end, it has been deemed preferable, as stated in the beginning of the paper, to represent the moisture contained in the atmosphere as grains of water per cubic foot of air.

In the paper presented to the institute I have simply given the results obtained by the use of dry air, and without any intention of claiming that the economy of fuel is represented entirely by the weight of moisture eliminated. It would require a very simple calculation to show that it is not. The calculations covering a period of operation show that the saving directly due to the removal of moisture represents 24 percent of the total fuel saved. But a far greater economy is effected in the use of the dry blast, and is represented by the reduction in temperature of the escaping gases and the greater efficiency in the reducing gases, as shown by the increase in percentage of carbonic anhydride. These items alone account for one-half of the saving in coke. In addition to the items already mentioned there is a material saving through the increased temperature of the hot blast, a lowering of silicon in the metal and in a similar amount of slag to be melted, as less coke is required per ton of iron.

The moisture charged into the furnace through the raw material is many times greater than would enter the furnace from the atmosphere; but to get rid of it through simple evaporation by gases which have already performed their useful work is quite a different proposition from that of dissociating the quantity of moisture carried in from the atmosphere into the hearth of the furnace, where temperature is such a vital element.

During the month of December there was an excellent opportunity of noting the results obtained by the use of dry blast, as Nos. 1 and 3 furnaces at the Isabella plant (No. 2 furnace having been out of blast) were making the same grade of iron. These furnaces were nearly the same size, No. 3 being a little larger. The same ore mixture and fuel were used in each furnace, and the conditions under which they were operated were identical. No. 1 furnace was blown with dry blast containing one grain of moisture per cubic foot of air, while No. 3 furnace used natural air, which, being drawn from the engine room, contained from two to four grains of moisture. Although this period represented the best conditions as to dryness of air in that climate, and furnaces under ordinary conditions increased decidedly in output above the average, yet the results obtained from a small and uniform content of moisture in the dried air supplied to the blowing engines in contrast with the varying content in the atmosphere were very striking.

From Dec. 1 to 22, inclusive, the results were as follows:

	No. 1 furnace, dry blast.	No. 3 furnace.
Average daily product	440 tons.	400 tons.
Average coke consumption	1,858 lb.	2,309 lb.

As connections had been made to the dry blast main for four blowing engines, and as only three had been used on No. 1 furnace, it was decided to connect the fourth engine to the main and supply No. 3 furnace with one-third dry blast. This was done on Dec. 23, and it was decided not to make any increase in the burden or to change the revolutions of the blowing engines in order to see what effect the use of approximately one-third dry air would have on the output of iron. The furnace immediately began to drive faster, and the average daily product from Dec. 23 to 31, inclusive, was 461 tons, an increase of 61 tons per day.

The increased efficiency of the furnace can be directed, in the main, to either increased output or to economy of fuel, according to the location of the works and as the commercial problems suggest.

The drying of the blast finds, to some extent, its equivalent in an increase of temperature in the hot blast which is wholly available, as the removal of the moisture represents a calorific gain in the furnace hearth proportionate to the quantity of moisture removed; but the dry blast provides uniformity, which the hot blast does not provide.

Comments on the Gayley Dry Blast.

Mr. Gayley's reply to the discussion on his paper, as given above, will be seen to be an answer also to some of the comments that have appeared in the technical press in the past three months. Below is an abstract of one of these—a communication in *Comptes Rendus* by M. A. Lodin. The writer says in substance:

The results obtained are in contradiction to the views hitherto held as to the importance of moisture in the blast, and considers that the striking results noted are probably due to special local conditions. The total "heat bills" for the two cases quoted by Mr. Gayley show a difference due to the heat

of decomposition of the moisture representing 2.8 percent of the total heat evolved, and it is not obvious how the saving of this should effect an economy of 19.8 percent in the coke used. This heat, however, is absorbed in the immediate neighborhood of the tuyeres, where a very high temperature is necessary, and where the only portion of the heat available is that given out between the temperature of the burning fuel and that of the molten slag or pig: this difference is never very considerable, because the carbon is here burnt only to monoxide. Hence small subtractions or additions of heat here will have a very important influence on the coke consumption. In the Isabella furnaces, with which Mr. Gayley worked, this influence is exaggerated by the low temperature of the blast, and the rise of 100 degrees Cent. in the blast temperature resulting from the drying is largely responsible for the improved results. Had the blast been heated to 500 degrees Cent., instead of being dried, probably the same improvement would have resulted. In Europe, where the blast is heated to 700 degrees to 800 degrees Cent., the effect produced by previous drying will almost certainly be much less than that obtained by Mr. Gayley.

M'DOWELL, STOCKER & COMPANY.

A decade of active business is being rounded out by McDowell, Stocker & Co., of Chicago, the firm having been established on May 1, 1895, by David McDowell, formerly traveling representative for Chas. H. Besly & Co., and H. A. Stocker, who had represented the Diamond Machine Co. The foundation of the firm was principally laid on sales of second-hand machinery, but the partners gradually acquired agencies for new machinery. In 1899 the business was incorporated, with Mr. McDowell and Mr. Stocker equal shareholders. Mr. McDowell was made president and Mr. Stocker secretary and treasurer. In the meantime the premises at 61 South Canal St. were outgrown and the store at 59 and the second floor were added. Finally in 1903 even this space was inadequate, and the company leased the entire building at 59 and 61 South Canal St., including four floors and basement. David McDowell died in June, 1904. At that time his son, W. J. McDowell, and E. L. Essley, who had been in the employ of the company for five years, were negotiating for the purchase of Mr. Stocker's interest. Mr. McDowell's sudden death put an end to the transaction temporarily, but the matter was revived again in October, and on Dec. 1, 1904, Mr. Stocker sold his interest to Mr. Easley and the younger McDowell. Mr. McDowell was made president and Mr. Essley secretary and treasurer. W. J. McDowell entered the employ of McDowell, Stocker & Co. in Sept., 1902. He had graduated in science at the University of Chicago and studied mechanics at the Armour Institute. Mr. Essley has been interested in the machine tool business in Chicago for 15 years, for eight years of that time with Manning, Maxwell & Moore.

Under this new arrangement several changes have been made, particularly in the office arrangement. The office is now located on the first floor and is provided with a private telephone system. The long lease on the warehouse which the company has utilized has been disposed of and the store immediately adjoining the present offices to the south has been opened. This easy accessibility to stock is a great convenience. Among some of the leading machine tools in the country for which McDowell, Stocker & Co. are selling agents in Chicago and vicinity are the following: Becker-Brainard milling machines, Bradford engine lathes, Burke bench milling and tapping machines, Colburn boring mills, Fosdick drills, Hamilton engine lathes and drill presses, Belmer planer, Whitcomb single belt drive planer, Consolidated Power presses, Kempsmith Milling machines, Springfield engine lathe and shaper, Milwaukee shapers, Diamond Machine Co.'s grinders, Harrington lathes and multiple spindle drills and Walcott shapers.

Southern Merger Abandoned.

NEW YORK, March 7.—Announcement was made yesterday of the laying aside, for the present at least, of the project for the consolidation of the four leading Southern iron companies. The statements heretofore made as to the proposal for Sloss-Sheffield Steel & Iron Co. common stock are correct, but the financial arrangements of Joseph H. Hoadley and his associates seem to have encountered obstacles. The interests which it was claimed had acquired control of the Tennessee Coal, Iron & Railroad Co. by purchases of stock in the market could not assert their control until the annual meeting on May 3. It would then be determined whether they could elect their directors or not. The board is a classified one, the terms of only a third of the board expiring each year. It was a question, therefore, whether those who are reported to have acquired 51 percent of the company's stock—John W. Gates and others—could get a majority in the board at the coming meeting. This might require another year. It has been stated on behalf of those holding a controlling interest in the Sloss-Sheffield Steel & Iron Co. that there was no intention at any time of putting the company as it now stands into a consolidation. They were only desirous of selling their stock outright, leaving to others the task of managing its affairs after such sale.

President Maben, of the Sloss-Sheffield Steel & Iron Co., left this city yesterday for Birmingham, Ala., owing to the negotiations for the merger having been brought to a halt. Mr. Maben said that the attempt to effect the consolidation had not been abandoned, but that a number of circumstances had developed which would cause some delay in the matter. He added:

"Mr. Hoadley, who is greatly interested in the proposed consolidation, has been unable thus far to carry out his agreement with the Sloss officials relative to the purchase of the necessary stock to obtain control of their company, although he has personally done everything he could. We asked 125 for the common stock, which Mr. Hoadley was perfectly willing to pay, but which his people have not as yet consented to. The fault is not with Mr. Hoadley, but with certain interests in the Tennessee company which have blocked the proposed merger for the time being. On all sides it is recognized as a good thing, and personally I believe it is only a question of time when it will be effected. Just at present the negotiations have reached a stage where my presence in this city is unnecessary, and so I am returning to Birmingham."

Agreement on Rivet Prices.

For a number of years there has been no agreement among rivet manufacturers as to prices. There has not even been a base size, and much irregularity has resulted. The manufacturers of large rivets have now agreed upon a base size ¾ in. to 1¼ in. diameter, inclusive. The extras are as follows:

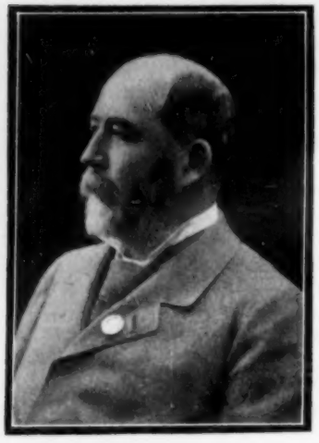
½ in. to 9-16 in. diameter	25c	per 100 lb.	extra
⅝ in. to 11-16 in. diameter	15c	"	"
Lengths shorter than 1 in.	50c	"	"
Countersunk heads in quantities of less than 1,000 lb. of one diameter	25c	"	"
Flat head rivets	25c	"	"
Rivets packed in 100 lb. kegs	10c	"	"

Special heads, diameters other than above enumerated, and rivets made cold, to be charged for extra at discretion of the maker.

The executive committee of the Sloss-Sheffield Steel & Iron Co. has recommended an initial semi-annual dividend of 2½ percent on its common stock and the usual quarterly dividend of 1¾ percent on the preferred stock, payable April 3. The action is expected to be ratified by the full board of directors.

NEW HONOR FOR EDWARD P. MARTIN.

At the annual meeting of the Institution of Mechanical Engineers held in London on Feb. 17, Edward P. Martin was announced as president for the ensuing year; Arthur Keen and Sir William T. Lewis, Bart., as vice presidents, and the following members as council: George J. Churchward, Henry Davey, William Dean, H. Graham Harris, the Right Hon. W. J. Pirrie, LL. D., Sir Thomas Richardson, Mark H. Robinson.



Edward Pritchard Martin, the new president, was born at Dowlais in 1844. In 1860 he began work with the Dowlais Iron Co. and in 1869 became deputy general manager. In 1874 as general manager of the Blen Avon Co.'s works he identified himself with the inventions of Thomas and Gilchrist, working at the dephosphorizing of steel, and for his services in this connection he received the Bessemer medal. In 1882 he became general manager of the Dowlais Iron Co. and erected the new steel works at Cardiff. On the amalgamation of the Dowlais Iron Co. with the Patent Nut & Bolt Co. he was appointed deputy chairman and managing director of Guest, Keen & Co. He retired from this position in 1902 but is still a director of Guest, Keen & Nettlefolds, Ltd. He is a past president of the Iron and Steel Institute and of the South Wales Institute of Engineers and is a member of the Institution of Civil Engineers. Mr. Martin was one of the prominent members of the Iron and Steel Institute who visited the United States in October and November, 1904, and is one of the best known, in this country, of British steel masters.

The Huntsville Foundry & Machine Co., Huntsville, Ontario, recently incorporated, is unlike some enterprises which do a great deal of talking and obtain a charter before operations are commenced. This company had its buildings erected and some casts run off in the foundry, and considerable machine work done, before the charter was granted. There are five members of the company, who provide the capital stock of $20,000. F. H. Tool, the general manager, has been connected with large firms in Ontario and Vancouver. A. C. Suttaby is superintendent of machine shops and T. D. Moase superintendent of the molding shops. The officers are: President, J. H. Johnson; manager, F. H. Tool; secretary-treasurer, D. M. Grant. Huntsville is a town of 3,500 inhabitants, on the main branch line of the Grand Trunk Railroad, and has not heretofore had a foundry or machine shop. The company considers its prospects for success excellent.

The Savage Hill Fire Brick Co., Uniontown, Pa., has purchased the fire brick plant of the Delaney Fire Brick Co., Fairchance, Pa. In addition to the present stockholders of the Savage Hill Fire Brick Co., the new organization includes J. M. McKinley, formerly connected with the Harbison-Walker Refractories Co. and McClellant Leonard, of the Delaney Co. The officers of the company are Harry Whyell, Uniontown, president; George B. Burchinal, Uniontown, secretary and treasurer, and J. M. McKinley, general manager.

Professor L. von Tetmajer, one of the best authorities on material testing, died a few weeks ago at Vienna. Professor Tetmajer was educated at the Zurich Polytechnic, and began to lecture there in 1873. When the first International Congress for the Unification of Methods of Testing Materials met at Zurich, in 1895, he was elected president, and he also presided over the subsequent congresses at Stockholm in 1897, and at Budapest in 1901. He did a great deal to overcome the prejudices against Thomas steel rails and in finding applications for blast furnace slag. He wrote a number of books on various subjects, such as basic converter iron, Thomas steel rails, the influence of punching on the strength of iron, and slag cements. After conducting the department for material testing at Zurich for more than 20 years, he accepted a call to the Technical High School at Vienna, which soon apointed him rector. He spent only three years at Vienna and died while delivering a lecture.

Probable Advance in Wages.

Following the increase of wages of employes of the Frick Coke Co., it has been widely reported that there will be a general advance of wages of United States Steel Corporation employes. Although no official statement has been issued, a high officer of the Steel Corporation said in New York that a general increase in wages was under consideration. The average amount of increase, he said, had not been determined, but it was practically certain that a large majority of the employes would benefit by the proposed readjustment of the wage scale. Probably no official announcement would be made before April 1.

The Vulcanus Forging Co., Cleveland, filed a deed of assignment in insolvency court March 7. Liabilities are placed at $95,000 and assets at $25,000. Charles O. Gilbert, who is manager of the company, was named as assignee.

The new steamer "Hazel Dollar," soon to sail from Glasgow for San Francisco, is to call at Rotterdam for a cargo of 7,000 tons of steel rails for the coast. She has been chartered for this cargo by Henry Lund & Co., of San Francisco.

A booklet from James Bonar & Co., Inc., of Pittsburg, deals with feed, water heaters, gauge cocks, exhaust heads and mufflers, oil filters, oiling systems, steam traps, elevator rod lubricators, flue cleaners, balance valves, coke oven valves, grease boxes for tin plate rolls, and a line of sheet metal work in general. Another booklet tells the autobiographical tale of a drop of oil and this smooth proposition submits something of a lubricating experience from oil field to filter, an experience of especial interest to machinery men.

The power of the electrical plant of the Ohio works of the Carnegie Steel Co., Youngstown, O., is to be greatly increased, and it is probable that sufficient power will be generated in the new plant to supply all the mills of the American Steel Hoop Co. in that district.

Arrangements have been completed by the trustees of the Franklin fund of Boston and representatives of Andrew Carnegie and the latter will duplicate the Franklin bequest with $400,000, just doubling it, the total to be used for the establishment of a mechanical institute or trades school along the lines of the Cooper Institute in New York. It only remains for Mayor Collins, as chairman of the trustees, formally to notify Mr. Carnegie, which will be done in a few days.

A strike of 300 laborers at the Republic Iron & Steel Co.'s works at East Chicago may be followed by a shutdown of the plant. The men are dissatisfied because their Sunday wages were reduced, the company refusing to pay as much for seven hours' work on Sunday as the ordinary week day of ten hours.

The Mahoning Foundry & Machine Co., Youngstown, O., has purchased the punch and shear department of the George B. Sennett Co., of that city, including all stock on hand. The purchaser will push the business vigorously. The capacity of the plant is twenty tools per month.

PHILADELPHIA FOUNDRYMEN'S ASSOCIATION.

The 145th meeting of the Philadelphia Foundrymen's Association was held at the Manufacturers' Club, 1409 Walnut street, on Wednesday evening, March 1, with Vice President Alex. E. Outerbridge Jr. in the chair. There were about forty members and visitors in attendance. The treasurer's report showed a balance of $2,197.74 in the treasury, all bills to date being paid.

The secretary read a letter which had been received from the Associated Foundry Foremen of Philadelphia and vicinity, extending an invitation to the members of the Foundrymen's Association to become associate members of their organization and attend their meetings. This association was formed recently, one of the principal objects being the improvement of the working department of the foundry. Mr. Evans also announced that the subject to be presented before the Foundrymen's Association at the meeting in April would be "Foundry Costs," and the probable subject for May would be "Cores and Core Making."

Testing for Fragility.

Thorsten Y. Olsen, of the firm of Tinius Olsen & Co., Philadelphia, was called upon to read his paper entitled "The Fremont Method of Determining the Fragility of Iron and Steel." The speaker explained that his knowledge of the subject was based mostly on translations from the French of Mr. Fremont's papers to the Society for the Encouragement of the National Industry, together with a personal acquaintance with Mr. Fremont at Paris in 1900. In addition, he had been able to make various experiments on one of the Fremont machines at the laboratory of Tinius Olsen & Co. The speaker illustrated his address by the use of lantern slides, some of which are reproduced here through the courtesy of the Engineers' Club of Philadelphia. Mr. Olsen said in part:

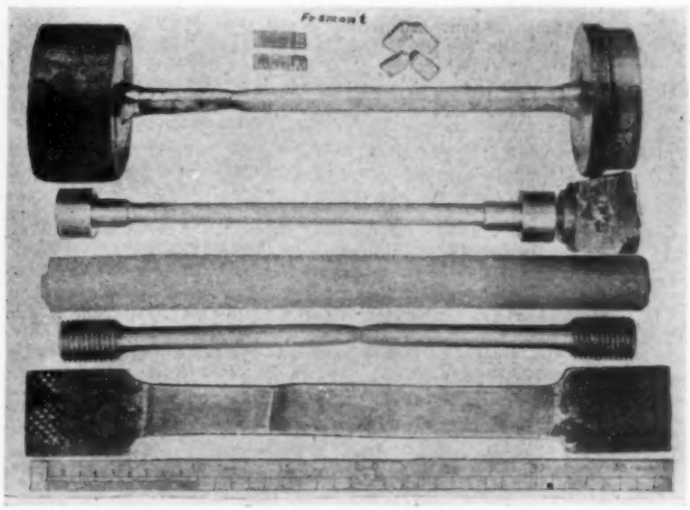


FIG. 1.

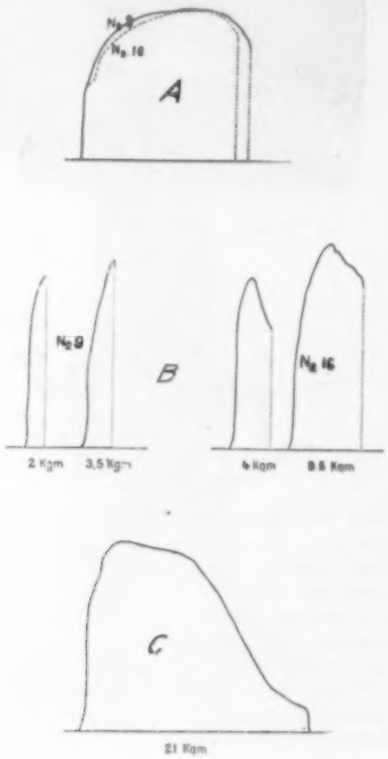


FIG. 2.

"According to Mr. Fremont, the test of tension owes its great growth to research work on iron and steel by Mr. David Kirkaldy in 1860, together with the development of the Bessemer steels. From this time the test of tension increased in importance, while that of shock or impact lessened. With tension testing definite results may be obtained; in fact, the standard machines of today are far more accurate than the homogeneity of the metal warrants. Today all the formulæ on which engineering problems are based are derived from results obtained from tension testing. Standards have consequently been adopted for various materials, varying with the known stresses they may be subjected to.

"Due to the lack of homogeneity of a steel and to the unknown stresses which must frequently take place, factors of safety are stipulated. Thus, if a boiler or a rail is designed properly it should break only by an unknown fault in the material. Accidents occur; but should they be called accidents when possibly they might be avoided? The defects in the steel are either lack of homogeneity or excessive fragility, or both. While the manufacturer has been plodding on, testing his material as required, being then safe from further responsibility or criticism, the scientist has been endeavoring to obviate, to the best of his knowledge, these two faults of steel. The first fault may be eliminated only slightly by making a greater number of tests; the second, fragility, by an impact or shock test. Today there is an impact test prescribed for a rail; why not for a boiler plate, wheel tire, or any portion of a mechanism subjected at some time or other to an abrupt or intermittent stress?

"'Fragility' is a known factor as far as the knowledge of its existence, but no further. Through lack of method, machine and standards, the consumer and producer alike have been compelled to ignore the fragility of their steel. Mr. Fremont, intent on relieving this state of affairs, commenced a series of investigations to determine the best means of testing for the fragility of steel.

"In France, testing as done in this country is looked upon as an extravagance, and only the largest companies can afford a moderate sized testing machine. The cost of the material and preparation of tension-test pieces are also considered a great expense, and hence Mr. Fremont, considering this, together with the desire of testing portions of plates nearest to the portion actually used, and of testing thin plates, made his test specimen very small throughout his various experiments Thus, his specimens are 10 mm. wide by 8 mm. thick and 30 mm. long, with a notch cut crosswise in the center of one of its broad sides, 1 mm. wide by 1 mm. deep. Fig. 1 shows the comparison of some tensile specimens with those of the Fremont type. Mr. Fremont first experimented with the bending test, and bent his small specimens over a die 20 mm. long, with

a punch-shaped tool in a machine. This machine was arranged with an autographic apparatus for producing the stress-strain diagram of the test.

"Now take the two steels which have given approximately the same diagram by the tension test. Call these two steels No. 9 and No. 16, as in Fig. 2. Subject this same material to a bending test. The second set of curves were obtained from

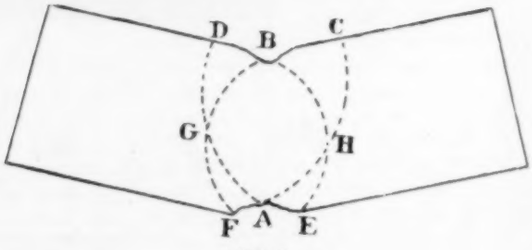


FIG. 3.

these two steels tested both with the rolling and at right angles to it. These curves show that in both cases No. 16 broke with a greater amount of work than No. 9, although the reverse was shown by the test of tension. Then, again, at C is a bending diagram of a steel which gave a similar tension diagram. This, as can readily be seen, gives a far better bending test than either of the other two steels.

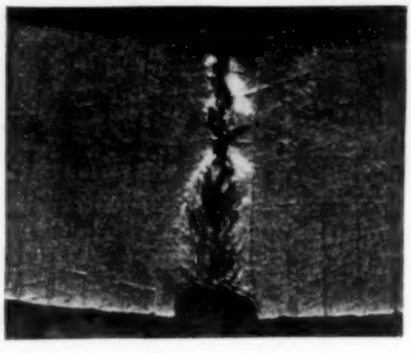
"These bending tests reveal some quality of the steel not revealed by the tension tests. Does the bending test reveal all? Will it reveal this quality on a less ductile steel? Take a soft steel, prepare a specimen as formerly, placing a notch at its under side to reduce the elongation, then polish one side and submit it to a partial bending. The deformations are easily seen in Fig. 3. They consist of the interposition of two elementary deformations more distinctly shown in the diagram. One deformation is that of swelling; the other that of depression. The depression E F G B H is nearly an ellipse, of which the major axis coincides with the line A B joining the point of impact to the notch. The swelling is a portion of the ellipse having the same major axis as the preceding, but the extremities of the major axis do not coincide. The two ellipses have the part A G B H in common, and thus the two deformations are in part neutralized. The other portion of the ellipse produces the maximum deformations, and the rupture takes place along the synclinal lines.

"Take now the case of a fragile steel as shown in Fig. 4. In this case the ellipse caused by the compression or the swelling is reduced to nearly nothing. The rupture is made downward by tension following the line A K in the diagram, and the rupture is effected abruptly with a very small expense of work. For steels of intermediate quality, the two ellipses will vary from the one extreme to the other. The rupture of these steels depends upon the position of the point K of the ellipse of compression. If the point K goes to A the metal will not be weak, while if the point K rests in the neighborhood of point B, the metal will be extremely weak. Thus both the prominence of the swelling and the position of the point K are important factors in this determination for the fragility.

"Here again in connection with these deformations Mr. Fremont states that in the period of permanent deformations the neutral surface is neither parallel to the faces nor at equal distances from the faces. The position of this surface may vary with the condition of the test, and, conditions being equal, with the quality of the metal; in other words, the more fragile the steel, the closer the neutral surface approaches the compressed side, and vice versa. As the neutral surface is not at equal distances from the faces, especially for fragile steels, the idea is inferred that a difference exists between the elastic limit for tension and for compression; thus Mr. Fremont, in a note to the French Academy of Science, stated that 'a steel is fragile—that is to say, it breaks abruptly by bending with the expenditure of a small amount of work—or non-fragile—that is to say, it breaks only in exerting a quantity of work proportional to that exerted for rupture by tension—according to whether the ratio of the elastic limit of tension to the elasic limit of compression is less or greater than unity.' This would not be an absolute means of judging the fragility, as the elastic limits would be taken from static tests, and not by means of a blow or impact.

"It has been proposed to require all steel to stand a certain drop of a hammer, and keep this a standard. Then, however, two points for discussion would arise: 1. The possibility of an arbitrary appreciation of the commencement of rupture. 2. The total resistance of the metal could not be measured.

"Let us take a slightly different form of drop testing. Take a bar and mark it off by small notches and place it under a hammer, dropping the same through successive heights, until a point is reached when an increase or decrease will rupture or prevent rupture of the bar. This gives the result only after testing a great number of bars; it also supposes the metal to be homogeneous; and finally it does not reveal accurately the fragility of the steel, because a steel breaking with an amount of work equal to N ft. lb. produced by a height of fall equal



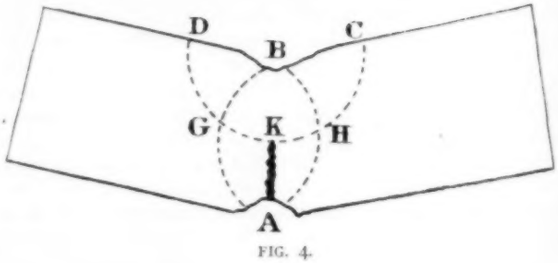


FIG. 4.

to P will break with a quantity of work less than N produced by a fall greater than P. To illustrate this, Mr. Fremont took from the same steel six specimens of the same size and marked them 1, 2, 4, 5, 6, and 3. He then tested them by shock at increasing speeds of from 1 meter to 1½ meters. These specimens so broken are shown in Fig. 5. The first five appear about the same, the sixth, or No. 3, alone being broken off

abruptly. The metal had thus become fragile for a speed of 1½ meters.

"To explain this fact it is supposed that the transmission of the forces in the material is not instantaneous and so depends on the speed of impact. The volume of the metal concerned will vary inversely with the speed of impact. In the product of the resistance by the deformation, the factor 'deformation' decreases as the speed of impact increases, and the rupture will be made with a less expenditure of work.

"The scientist Carnot in 1889 stated: 'If we suppose a steel or iron submitted to a continuous slow force, it is understood perfectly that this persistent force transmits itself successively from molecule to molecule in such a manner that all the molecules are submitted to like forces. In the contrary case, when the force is abrupt or instantaneous, it is understood that all the molecules touched can be disaggregated from the beginning, while the other molecules will support no apparent effort.' According to this, then, metals can exhibit very different qualities when submitted to a slow force or to an abrupt one.

"In tension testing the speed is a more or less important factor, depending on the ductility of the steel, and it is well known that an increase of speed increases the resistance of the metal but decreases the elongation.

"By comparing tests effected by rupturing specimens by

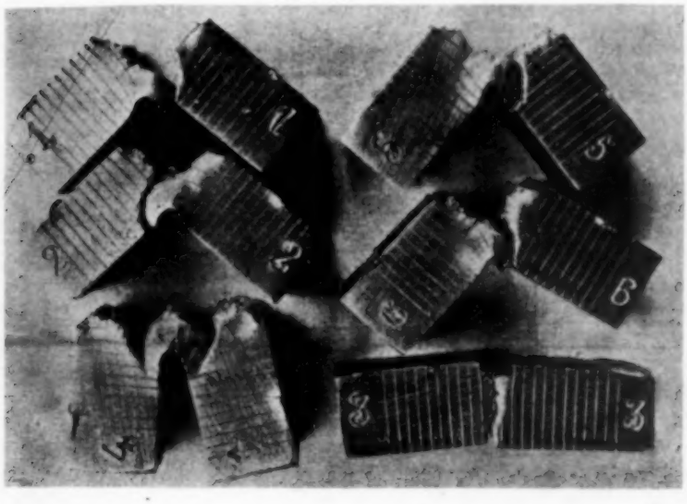


FIG. 5.

a repetition of blows and by a single blow, Mr. Fremont found that some steels ruptured by a single blow required but one-third to one-fourth the amount of work required by the repeated blows, and thus impact testing employing a repetition of blows is little better than a bending test. Steels appearing non-fragile by the first method would appear fragile when subjected to a single drop of a hammer just sufficient to break the bar. As the shock test varies with the speed of impact and the deformations become smaller, the fragility slightly shown in the bending test will appear in its true form in the impact test.

"The rate of molecular transmission of force through a steel may be one way of defining this fragility. It is also a fact that for the same steel this rate approaches a limit independent of the speed of impact when twice that sufficient to rupture the specimen. Knowing the desirability for an accurate and easy means for shock testing, Mr. Fremont presented a communication to the Academy of Science in 1897 proposing a method of registering the amount of work required to produce rupture by this means.

"As the speed of impact is a great factor, it is necessary to make the speed of the hammer sufficiently great to rupture the specimen with one blow, whatever the quality of the metal. If a steel then proves non-fragile to a drop of this kind it has been proven non-fragile to the test of a cannon. To determine the amount of work absorbed to produce this rupture, it is necessary to measure the residual work that is possessed by the hammer after rupture of the specimen. After numerous tests by shock Mr. Fremont finished a machine embodying principles by which this residual force could be measured. First, 'crushers' were employed from which the residual force in the hammer could be measured from their known compression; this, however, was not very practical, and in the commercial machine a set of springs is used to measure this residual force.

"The machine as built today is shown in Fig. 6. The whole of the machine is 18 ft. high; the part shown is about 7 ft. This represents the lower portion. The design is made double;

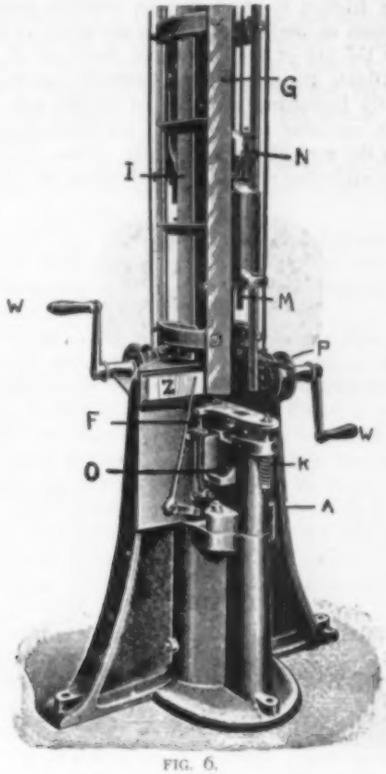


FIG. 6.

i. e., it is arranged so that two may operate on the same machine at the same time. The base of the machine is composed of two parts connected by bolts. Between them, and held tightly by them, is a central I-beam marked I. This carries the six cast-iron supports, at intervals, to which are bolted the four rolled steel guides marked G. Two anvils are bolted on opposite sides of the base, the whole weighing more than 1,500 lb. The weights of the hammers are 20 and 30 lb., or about 1-70 of the total weight of the machine. The anvils marked A contain in front and in back of the matrix vertical cylindrical holes serving for the lodgment of two springs. A cap of hard steel is placed directly over them. It is this cap or platform which receives the hammer after the rupture of the specimen.

"The hammer compresses the springs and the space traversed by them is then measured. As the springs rebound after the blow, it violently repels the cap, and so to offset this new shock the cap is held by two small springs, one of which is visible on the front of the anvil at K. These springs thus serve merely as a deadener to the cap when rebounding. On each side of the base and to the right of the operator is a windlass marked W, by which the hammer is easily and quickly raised. A ratchet and lever placed at P prevent the

downward motion of the hammer when placing the specimen in position.

"Each hammer has inserted at its lower extremity a hardened steel punching tool, as at M. A gripping device at N holds the hammer to the pulling cord until automatically released at the top of the machine. It is also released at any point by attaching a cord near N.

"To operate the machine we first raise the weight enough to allow room to place the specimen in position, notch side down, with notch directly to the center of the die. Then we turn the windlass, raising the weight to the top, where it is automatically released, and falling, breaks the specimen, which in turn falls through the die into the pocket at the side of the machine. Having broken the specimen, it is necessary to measure the work required to cause the rupture. The cap covering the springs pushes down a light steel tube at F, which is held by friction so as to give an accurate measurement of the deflection of the springs. This deflection is further multiplied by the aid of the instrument shown at Z.

"To calibrate the machine the hammers are raised through successively increasing intervals of height and dropped on the platen covering the springs. Corresponding marks are placed on the card of the instrument. Thus, the machine can readily be calibrated at any time with about ten minutes' work.

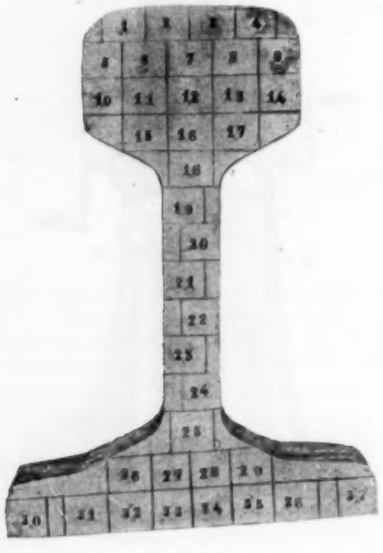


FIG. 7.

"The method, by using small specimens, reduces the cost of test pieces and their preparation, thereby furthering the great production of tests and thus aiding in establishing a standard homogeneity test. A second advantage is that the small specimen permits of testing thin plates, both with and across the rolling, as well as the possibility of testing parings or clippings from actual material used, or those nearest to any section subjected to the greatest known stress. In the third place the machine affords an accurate method of measuring the work necessary to produce rupture under standard conditions, always maintaining the same speed of impact. The machine as manufactured in this country will have a standard drop of 13 ft. with hammers weighing 20 and 30 lb., as these are the nearest English units to that used in the metric system.

"The specimen will be ⅜ in. wide, 5-16 in. thick, and 1¼ in. long, with a saw-cut 1-16 in. deep. The die is 13-16 in. wide. The machine can be shifted from the one standard to the other without any material change. The specimens may be prepared either by hand or in quantity by a small machine constructed for the purpose.

"Fig. 7 represents the section of a rail showing the method of cutting out Fremont specimens from the entire section. Thus, any rolled form can readily be tested to determine the effect of the rolling on any portion of it. The rail after the test is shown in Fig. 8, the pieces bent having been subjected to the bending test, while those appearing broken abruptly were tested by shock.

"In testing cast iron for fragility a machine similar to that described can be used where neither the drop nor the weight of the hammer need be as great, and thus lighter springs could be used which would show smaller differences in the material. As cast iron is extremely fragile, the speed necessary for rupture need not be as much greater than that necessary to produce rupture for steel, or in other words the amount of work required to produce rupture would not vary to such an extent with the speed of impact as in the case of steel. Thus, although cast iron may be tested on a machine as described, it would not be necessary on account of maintaining the same conditions of test. A smaller and cheaper machine could thus be made for such work."

DISCUSSION.

A. E. Outerbridge Jr.: The machine is different from one with which I am familiar, where the residual force is measured in an entirely different way. I would like to ask Mr. Olsen if he tested any of those pieces on a rigid non-yielding anvil? I understand the anvil is practically supported on springs which give at the moment of impact, and the residual force is determined by the compression of the springs?

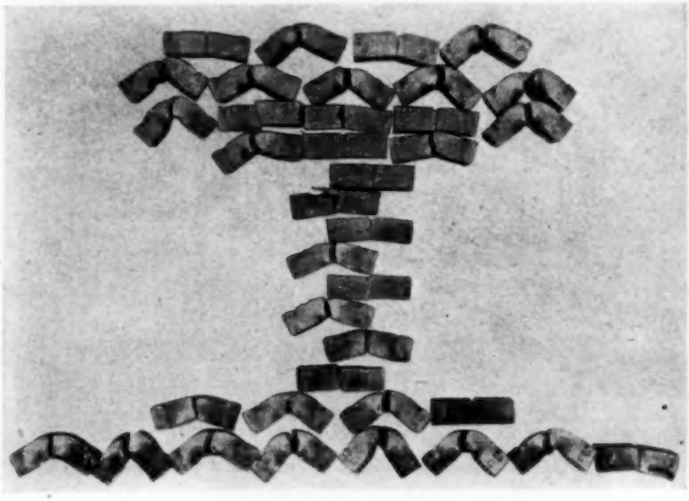


FIG. 8.

Mr. Olsen: The specimen is not connected with the springs: that lies on the anvil itself. After the specimen is broken then the hammer falls on the plate connected with the springs.

Mr. Outerbridge: The residual force in the hammer is measured by the compression of the springs?

Mr. Olsen: Yes. I have some broken specimens which in a tension test showed the same elastic limit, ultimate strength and elongation, but when subjected to shock test broke in various manners. Some show a fibrous structure, while others show a crystalline structure. Those exhibiting the fibrous structure broke with 300 to 400 percent greater work than the crystalline structures.

Mr. Outerbridge: It may be interesting to the members if I give you a brief account of an impact testing machine which has been in use in William Sellers & Co.'s works for about ten years. It is intended for impact tests of cast iron, but I think it would be equally useful for steel. We made a great many tests of that kind and the same difference is observable in cast iron that we have heard about tonight in steel; that is to say, you may have bars of cast iron which show a very high tensile strength, and of course there is very little elongation in testing cast iron, but when you subject two pieces of cast

iron (the companion bars having shown approximately the same tensile strength) to an impact test where you are able to measure the residual force remaining in the hammer after the break, you will find there is sometimes an enormous difference in resilience amounting to several hundred percent, and that is a very important matter. So far as I know, no account has ever been given of the machine I am about to describe now. We first made a machine on the same principles as the one described, which is what we called a "gallows" machine, where the weight, 14 lb., is allowed to fall from a certain height and the residual force is measured by the hammer. We subsequently modified that machine by making an improved form of hammer, somewhat like this mallet. This may represent the hammer, which was in this case 20 lb., having a steel nose put on the end; in fact, the whole hammer was a piece of steel on a rigid arm, which was supported about 3 ft. in length on ball bearings, so that the friction was reduced to the smallest possible degree. This hammer is raised to a certain point where there is a trigger that holds it. When that trigger is released the hammer falls, and if there is no intervening object to impede its force it will of course swing to the full length of the arc, that point being measured by a moving pointer which travels with the hammer and remains at rest at the extreme distance, thus recording the swing of the hammer on a graduated arc. The hammer if started will continue to swing something like a quarter of an hour, each time the hammer going a little less far until eventually it will come to rest. It takes more than 15 minutes to come to rest, owing to the fact that the friction is reduced to a minimum by the ball bearings. Just at the vertical point there is a rigid support for cast iron test pieces. It is a support similar to that which we use for transverse tests of cast iron. The bar is 1 x 1 x 15 in. and put in with the supports 12 in. apart and rigidly fixed so that there is no movement. In this case there are no springs. There is alongside this test piece a pointer which is just sufficiently rigidly supported so that when you move it out to any point it will stay there—it won't fall back. The arc is graduated in inches up to the extreme end. As I say, when there is nothing interposing, the hammer will swing out to the extreme end and then come back. The pointer will be carried with the hammer and left at the extreme point to which the hammer swings. Then, if you want to measure the amount of decrease each time the hammer swings you simply move that pointer back and then the hammer carries it forward again. Of course there is a trifling resistance offered by the pointer, but it is the same in all cases, so that this is négligible. This hammer is so arranged so that you break the bar on the first blow on all occasions. If you have a piece which offers very considerable resistance—take a piece of very strong cast iron for example—the resistance offered by that piece will be quite considerable, and of course the hammer will not go out so far, and the pointer will rest at the place at its extreme swing. It will never be moved by the second swing, and the moment the piece is broken it falls out of the way. We have made a large number of tests of cast iron with that machine and have many records. I am not prepared tonight to give an account of these records, but we found by that machine that there is a very much greater difference in the resistance to impact than was revealed by the transverse test machine, either from the resistance to strain or from the bending record; in other words, the ductility or resilience, or bending quality, or resistance to shock of cast iron cannot possibly be measured accurately by either the transverse or tensile tests alone. There is no measuring by compression springs whatever in this machine. It is simply the resistance given by the breaking of the metal that is recorded by the swing of the hammer.

Mr. Olsen: I believe there is a machine of that kind at the Lehigh University. In steel, where you require a certain speed of impact, which according to the Fremont method is absolutely necessary, it would be useless. If you increase the height of fall you will break the specimen with a less amount of work, so one specimen passing your test will fail when subjected to the Fremont test. If I raised my hammer up to half the height I would break the bar, but it would take a greater amount of work. If I raise it twice that height it will take a less amount of work.

Mr. Outerbridge: The same principle applies where it is a swinging hammer. It is still impact.

Mr. Evans: Is the drop of that weight the same as the impact of a cannon ball?

Mr. Olsen: The speed of the Fremont machine is equivalent to the speed of a cannon as far as the breaking of the specimen is concerned. After you reach a certain point any further increase in speed will not change the transmission of the force through the molecules. There seems to be a limit. If you get a less speed it is within the limit. The trouble with the pendulum machine is that you cannot increase the speed sufficiently for testing steels, and the specimen is not placed on a rigid anvil. You could not easily get a speed of hammer equivalent to a drop of 13 ft. That is necessary for the steel test. If you get a much lower you will get within the limit before mentioned.

Mr. Outerbridge: The first weight we made was 40 lb., and we found that that was excessive, so we reconstructed the machine and reduced the weight to 20 lb.

Mr. Olsen: If you increase the height of fall any further the amount of work required to break the bar will not decrease. There seems to be a limit where the transmission of the forces will not decrease.

Mr. Outerbridge: We found a very curious thing in connection with the cast iron drop testing machine. I had occasion to describe that in 1896 in a paper read before the American Institute of Mining Engineers. We found if we had a dozen bars of iron cast of the same size, from one ladle of iron in one mold, presumably under precisely the same conditions, by allowing this drop weight of 14 lb. to fall a height of 12 in. it would break any of the pieces; and before we had means of measuring the residual force we did not know whether that piece would have broken by a drop of the hammer of 6 in. or 12. This drop fell vertically in guides. There was no friction at all, because it fell in free space. In order to ascertain whether the fall of 12 in. was excessive—more than necessary for the break—we took one of those companion bars and raised that drop by inches, 1 in., then 2 in., 3 in., 4 in., 5 in., 6 in., 7 in., 8 in., 9 in., 10 in., 11 in., 12 in. It would naturally be supposed that the bar would break before the hammer was raised to 12 in., because it had been subject to 11 blows at constantly increasing heights. We were surprised to find that in no case did the bar break at 12 in., whereas, in every case, if you allowed that hammer to drop from 12 in. in the first place, the bar would break. The question was, what was the cause of that difference? In a large number of experiments we showed conclusively that it was owing to the fact that each slight blow that you gave to the cast iron enabled it in a measure to relieve itself of the cooling strains, and therefore after it had been subjected to a number of blows, from a height not sufficient to break the bar, the bar was so much increased in its shock-resisting quality that it would not break. In some cases I have found that it took 20 blows from a height of 12 in. after the hammer had been allowed to fall from a lesser height several times to break the bar. These experiments are all recorded in the paper which I read before the American Institute of Mining Engineers in 1896. Everybody has known for a long time that if you strike a sharp blow on the rim of a pulley that has been cast (supposing the pulley is defective, or for some reason you want it broken up), there will be a concussion and the pulley will open so you can put a knife blade very readily in the crack. Sometimes you can put a steel wedge in the opening. It may open as much as a sixteenth of an inch; but if you strike an old pulley that has been run in the shop for a

length of time—a worn-out pulley that you want to break up—and if you give it exactly the same blow, when you break it you will find there is no sudden snap and no wide crack; you could not put a piece of tissue paper in it. This marked difference is due to the fact that the cooling strains have been relieved by the mechanical action of vibration in service. Steel is an entirely different metal from cast iron and the same conditions do not exist. It might be a good thing, however, to try these tests on steel; instead of letting the hammer fall from the ultimate height, take a duplicate piece and give it 20 blows from one-half the height and then raise it by inches to the ultimate height and ascertain whether the piece will break by a blow from a height which was sufficient to break a companion piece with one blow.

Mr. Olsen: In cast iron of small dimensions I do not think, if it is as shown by the repeated blow as in using large specimens, it would show up.

Mr. Evans: According to that the tumbling barrel for cleaning castings must make the castings stronger.

Mr. Outerbridge: Yes; that is true. It was formerly the rule with us that all fragile castings must be cleaned in the pickling tub, and must not go to the tumbling barrel for fear of breaking the small pulleys. Now that rule has been entirely reversed. All fragile castings are put in the tumbling barrel now.

After the adoption of a vote of thanks which was extended to Mr Olsen for his presentation of the subject, the meeting adjourned. Among those present were the following:

Alex. E. Outerbridge, Jr., Wm. Sellers & Co.
Dr. E. E. Brown, E. E. Brown & Co.
Hy. Yost, Thomas, Roberts, Stevenson & Co.
Wesley Pullman and F. C. Pullman, J. Wesley Pullman.
W. W. Phillips and H. I. Tripple, Fairbanks Co.
Tinius Olsen and Thorston Y. Olsen, Tinius Olsen & Co.
Harry A. Phillips, Boulton Mfg. Co.
Thos. J. Smith, Midvale Steel Co., Nicetown, Philadelphia.
Ed. Burgen, Bement, Miles & Co.
W. O. Steele and Walter McWater, Bateman Mfg. Co., Grenloch, N. J.
Benj. Holt and Herbert Holt, Camden Fdy. Co., Camden, N. J.
W. J. W. Moore, Ernest Law & Co.
Adam Pugh, I. A. Sheppard & Co.
J. Pierpoint, J. K. Dimmick & Co.
F. W. Myers, *Iron Trade Review.*
W. B. Franklin and R. W. Martindale, United States Cast Iron Pipe & Foundry Co.
L. Silvester, J. Wesley Pullman.
Geo. C. Davis, Chemist.
Wm. A. Perrine and C. D. Orr, Abram Cox Stove Co.
Luther Shick, I. A. Sheppard & Co.
H. O. Evans, Thos. Devlin Mfg. Co.
A. G. Warren, J. W. Paxson Co.
Wm. Hanson.
John A. Clark, Clark's Iron Fdy.
Thos. J. Kelly.
J. Thompson, J. Thompson & Co.
S. C. Wells, North Wales Fdy. Co., North Wales, Pa.
W. E. Marks, J. Thompson & Co.
Arthur Simonson, Wm. Wharton, Jr., & Co.
Howard Evans, J. W. Paxson Co.

A meeting of business men interested in Ralph L. Morgan's project to locate a steel plant at Presque Isle, O., was held at the Toledo Club a few days ago. The meeting was presided over by John Craig, and J. W. Flowers was secretary. The committee which recently visited South Chicago plants reported and it was resolved that Mr. Morgan's steel mill project be endorsed. An effort to finance the project will now be made.

Concerning the newspaper report that the Warwick properties at Warwick, O., and Massillon, O., have been sold to a New York syndicate, the Warwick Furnace & Machine Co., Massillon, O., advises us that the properties have *not* been sold. There may be some change made in the organization of the company, but at present there is nothing definite.

LAKE SUPERIOR IRON MINES.

Articles of incorporation have been filed for the Moulton Mining Co., of Two Harbors, Minn.; capital stock, $100,000, to mine and manufacture iron, copper and other minerals. Incorporators and directors: James H. Lunz, David Lawrence, P. G. Pastoret, John B. Boyer, Gustav Nelson and J. W. Brownell.

The Munro mine of the Buffalo & Susquehanna Iron Co., Menominee range, will be the scene of great activity this season. Day and night shifts are employed and the forces will soon be materially increased. In addition to the usual mining work this season, a contract will soon be let for the stripping of a territory 420 ft. in length by 100 ft. in width. This will be one of the largest stripping contracts ever let on this range and is a steam shovel proposition, the overburden of earth running from 20 to 30 ft. in depth. In addition to this work, the company is now engaged in driving a drift in a westerly direction some 400 ft. to connect the present workings with the old Spencer shaft. The ore shipped last season gave excellent satisfaction at the company's furnaces, and it is proposed to increase the output of the mine from 32,332 tons last season to an even 100,000 tons.

The Empire Iron Co. has just been organized in Chicago to operate on the Cascade range, near Palmer, in Marquette county, Mich. The organizers of the company are Thomas Dennehy and Adolph Kurz, of Chicago, and John T. Jones, of Iron Mountain. Mr. Dennehy is the president of the company, Mr. Kurz the secretary and treasurer, and Mr. Jones the general manager. The Chicago office of the company is in the Unity building. The property consists of eighty acres. There is an outcropping of ore 300 ft. in width extending across the two forties. Mr. Jones states that samples taken from the outcropping show contents of 47 percent iron, .056 phosphorus and about 2 percent moisture. There is reason for believing that, as the deposit is opened up, the grade will improve.

Rebuilding Chattanooga Furnace.

C. E. Buek, president of the Lacey-Buek Iron Co., Birmingham, Ala., has purchased the Chattanooga furnace, Chattanooga, Tenn., and on March 3 made application for a charter for a company to be known as the Chattanooga Blast Furnace Co. with a capital of $225,000, of which he will be president. Mr. Buek has commenced to dismantle the old stack with a view of building a new one and also adding blowing engines and putting the furnace in first-class condition, all of which will take about four months. The furnace was first blown in in 1874. It was rebuilt in 1885, 1899 and 1901.

In the settlement of the H. W. Borntraeger estate at Pittsburg, Judge Hawkins' decision embodies references to the great increase in the value of the 1,024 shares of stock of the deceased in the H. C. Frick Coke Co. It was appraised at the time of his death a few years ago at $64,515. Upon the consolidation of this company with the H. C. Frick Coke Co. his stock was exchanged for bonds of the Carnegie Steel Co. valued at $165,000 and stock valued at $162,000. For the $64,515 worth of stock in the H. C. Frick Coke Co. the trustee of the estate received stock and bonds of the Carnegie Steel Co. valued at $327,000. When the United States Steel Corporation was formed this stock and the bonds were exchanged for new securities valued at $525,970.06 or $461,558.06 in excess of the inventoried value.

The Middle States Coal Co., Columbus, O., expects to construct from 250 to 300 coke ovens on its property at Huger, located on the main line of the N. & W. Ry. near Welch, W. Va. By the middle of the summer, the company expects to produce 1,500 tons of all grades of coal at this mine, part of which will be made into coke as soon as the ovens are completed. This plant is located in the Pocahontas district. Estimated cost of ovens, $125,000.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of Their Wants:—

The North Chelmsford Machine & Supply Co., North Chelmsford, Mass., has been incorporated with a capital of $50,000. The incorporators are: H. Stanley Crysler, Lowell, Mass.; George C. Moore and Henry Woods, of Chelmsford, Mass.

The Loveland Foundry Co., Loveland, O., capital $10,000, has been incorporated by Daniel Donnelly, John A. Seymour, Harry Donnelly, George Chambers and Horace B. Jones.

The Columbus Structural Steel Co., Columbus, O., has been incorporated with a capital of $50,000. The incorporators are: Louis Ph. Hoster, Henry Richter, D. W. McGrath, Henry Maetzel and Joseph Schonthal.

The Sheer Bros. Fence & Iron Co., Cleveland, has been incorporated with a capital of $10,000. The incorporators are: J. T. Sheer, Eli G. Sheer and others.

The Parke-Pillatt Co., Chicago, has been incorporated with a capital of $10,000, to manufacture machinery. The incorporators are: J. E. Parke, B. Pillatt, J. F. Parke.

F. H. Davis & Co., 161 Devonshire St., Boston, are building a one-story shop and storehouse, 106 x 120 ft., at Cambridge. Their repair shop will be removed to the new building when it is completed, and they will probably be in the market for machine tools later in the season.

Marion Tank Co., Marion, Waupaca county, Wis., has been incorporated to manufacture machinery. Capital $25,000.

The Mountain City Foundry & Machine Co., Greenville, S. C., has received a charter from the secretary of state. Capital stock $8,000. The officers are as follows: President and treasurer, W. G. Gregory; vice-president, C. D. Boling; secretary and general manager, S. W. Reames. The concern is located near the Southern depot on Pinckney St., and has already begun operations. It will pay special attention to mill casting and engine work, but will not be limited to this field.

The Excelsior Mfg. Co., Chicago, has been incorporated with a capital of $2,500 to manufacture castings and machinery. The incorporators are: L. H. Flint, L. A. Koepfle and Wm. J. Krueger.

The Hennepin Bridge Co., Minneapolis, has been incorporated with a capital of $100,000. Incorporators: W. W. Roberts, C. J. Traxle and T. H. Thomson, all of Minneapolis.

The Middlefield Mfg. Co., Middlefield, O., has been incorporated with the following officers: Directors, F. B. Hubbard, F. W. Morse, C. M. Pierce, C. E. Lampson, P. Doerfer, L. B. Montgomery and J. J. Rose; president, C. M. Pierce; vice-president, C. E. Lampson; superintendent, F. B. Hubbard; secretary, C. D. Hoskins; treasurer, W. E. Norris. The company will manufacture an improved hot air engine, the invention of F. B. Hubbard, of Warren, and expects to have a plant in operation within thirty days.

The Knoxville Foundry & Machine Co., Knoxville, Tenn., has been incorporated with a capital stock of $25,000. The incorporators are: John P. Staub, Frederick Staub, Charles H. Smith, James H. Weicker and R. H. Sansom.

The Peoria Fence Co., Peoria, Ill., has been incorporated. Capital stock, $2,500. The incorporators are: Joseph W. Sommers, Benjamin L. Sommers and Chas. W. LaPorte.

The Dayton Pipe Co., Dayton, O., has been incorporated with a capital stock of $50,000. The incorporators are: W. W. Price, A. W. Price, C. H. Ware, F. S. Bacene and R. E. Condit.

The Stark Foundry Co., Canton, O., has been incorporated. Capital stock, $5,000. Incorporators: G. P. Bonsky, G. A. Bonsky, G. F. Ebel, P. Bonsky, E. J. Bonsky.

The Eureka Miter Machine Co., Bloomington, Ill., has been incorporated. The incorporators and equal stockholders are: H. H. Green, Thos. W. Evans, R. C. Rogers and John A. Peer. The capital stock is $20,000, divided into shares of $10 each. The office of the secretary is at 311 North Main St.

Gresberger Drop Trolley Co., 1001-1003 West Broad St., Richmond, Va., is in the market for malleable-iron castings or soft steel castings weighing from 5 to 35 lbs.

Davis-Forrest Machine Works, Savannah, Ga., is in the market for a brass and iron foundry, and wants catalogues.

R. G. Terry, 809 Court St., Lynchburg, Va., wants prices on foundry equipment, cupola, etc.; second-hand preferred.

Pee Dee Iron Works, Cheraw, S. C., wants prices on milling machine and planer.

The Cedar Falls Iron & Brass Works, Cedar Falls, Iowa, is in the market for belting and pulleys.

Sumter Iron Works, Sumter, S. C., which has been conducted by W. E. and John I. Brunson, has been incorporated with a capital stock of $12,000, and the following officers have been elected: John I. Brunson, president; W. E. Brunson, vice president and general manager; E. W. Moise, secretary and treasurer. The company will be in the market for machinery for installation in its machine shop.

The Oltmer Iron Works, Hoboken, N. J., recently incorporated with a capital stock of $25,000, has taken over the plant and business of Christian Oltmer, of that city, and will manufacture structural and monumental iron.

Fires and Accidents:—

A fire which started in the molding shop of J. Fleury's Sons, Aurora, Ontario, Feb. 28, destroyed core boxes in use and did considerable damage to the roof. Loss $2,000.

The John W. Johnson Machine Works, Upper Sandusky, O., were destroyed by fire March 1. The loss is $17,000, with no insurance.

The Lakeside Malleable Iron Works, Lakeside, Wis., three miles south of Milwaukee, was burned March 1. The plant was valued at $125,000, and is a total loss. The Bruce Engine Co.'s plant and the Racine Iron & Steel Works were damaged.

Fire destroyed the plant of the Fort Payne Stove Foundry Co., Fort Payne, Ala., Feb. 24. The loss is estimated at from $25,000 to $50,000.

The foundry of the Flint-Lomax Electric & Mfg. Co., Denver, Col., was damaged by fire Feb. 23. Loss $2,500, fully covered by insurance.

Fire on the evening of Feb. 25 at the foundry of John J. Bruce, 942-956 Kenyon Ave., Cincinnati, caused a loss of $1,500, fully covered by insurance. Mr. Bruce has been compelled to close down for about two weeks and intends to make important improvements, enlarging his plant.

New Construction:—

The A. C. Thompson Co., of North Sydney, C. B., will erect a nail plant with capacity of from 75,000 to 100,000 kegs a year.

Work on the new foundry and machine shops to be erected by McCarthy & Malinski, Cairo, Ill., has been begun. There will be three buildings.

The Crompton & Knowles Loom Works, Philadelphia, are receiving estimates on a foundry building.

The Midvale Steel Co., Nicetown, Philadelphia, will build a machine shop 57 x 75 ft. at a cost of $12,000.

The Washburn-Crosby Co., Minneapolis, will build a brick machine shop and warehouse at a cost of about $20,000.

The Columbia Nut & Bolt Co., Bridgeport, Conn., has awarded the contract for an additional building, which will be 50 x 100 ft.

The Columbus Structural Steel Co., Columbus, O., was organized last week for the purpose of fabricating structural material but not to engage in the rolling mill business. While the company has not yet decided upon any site, it expects to

do so soon, and to be in a position to put material on the market within a very short time.

The Keith Furnace Co., Des Moines, Ia., has just completed the erection of a new building to be used for offices and a pattern room. The space in the main buildings formerly used for this purpose will be given over to the foundry and assemblying departments.

The Davenport Locomotive Co., Davenport, Ia., will erect a large addition to its plant, a tract of 12 acres having been purchased recently for that purpose.

The Columbus Heating & Ventilating Co., Columbus, O., formerly the Vogelgesang Furnace Co., has decided to erect a new plant. The plans call for a two-story brick building, 120 x 190 ft.

The Santa Fe Railroad has invited bids for the reconstruction of that part of the shops of the company at Cleburne, Tex., destroyed by fire last July. The new building will be 180 x 340 ft., and will cost about $65,000.

The new plant of the Leyner Engineering Co., at Littleton, Col., erected on state land, has been completed. The machine building is 28 ft. long and is planned for lengthwise extension to 400 ft. The forging building is 61 x 161 ft., and the pattern building 41 x 141 ft.

The building which the Crane Co. will erect in Omaha will be 132 x 66 ft., six stories and fireproof throughout. The company hopes to begin work on the new building by the 1st of April.

The Texas Iron & Steel Co., recently incorporated under the laws of Michigan, expects to do business in Texas. It will build a rolling mill to manufacture merchant bar iron, spikes and fish plates. The officers have looked over several sites, but have not definitely decided as to location, which will be somewhere in the southeastern part of Texas. It is expected that the building of the plant will be begun within sixty days. Its capacity will be about 75 tons a day. W. S. Patterson, Utopia Hotel, Detroit, Mich., is one of the interested parties.

The Clarkesdale Machinery & Supply Mfg. Co., Clarkesdale, Miss., recently incorporated, has elected the following officers: President and general manager, Henry J. Davis; vice-president, J. H. Johnson; secretary and treasurer, B. Champlin. The contract for the plant, which will be 50 x 100 ft., has been awarded and work commenced. The contract for tools and machinery has been awarded to a St. Louis concern. The company expects to be ready for business by the 1st of May.

John H. Dialogue & Son., Camden, N. J., will rebuild the part of their shipbuilding works recently destroyed by fire.

The Georgia Iron & Coal Co., Atlanta, Ga., will build 200 coke ovens very near its blast furnace at Rising Fawn, Ga. Bids are now being received.

General Industrial Notes:—

In addition to the locomotive orders recently placed in the United States and Scotland for Japan, there were twenty-one ordered from German concerns. A Hanover manufacturer is to construct nine combined engines and tenders at a price of $9,662 each. A Berlin firm contracted for twelve at $9,691 each. An English firm made a bid of $9,756 each, but did not receive any order.

The Lott-Burton Co., of Chicago, recently incorporated with a capital stock of $20,000 for the manufacture and sale of steam and hot water boilers, hot air furnaces, cooking and heating stoves, commenced business March 1, taking over the business of James D. Lott & Co., 86 Lake St., the business lately carried on by Brown & Burton, of the same address, also the manufacturing and sale of Brown's rival water heaters. The Magee Furnace Co., of Boston, Mass., has appointed the new corporation as its Western representative. The offices are at 86 Lake St.

The Pederson Multi-Piston Engine Co., Superior, Wis., recently organized to manufacture the Pederson multi-piston engine, has elected the following officers: President, P. C. N. Pederson; vice-president, James C. Pederson; secretary-treasurer, A. J. Pederson.

The recent fire in the plant of the Ashton Valve Co., Boston, was of slight importance and that part of the foundry which was damaged has been replaced.

N. B. Harrington & Co., manufacturers of gasoline motors at Buffalo, will move their plant to Batavia, N. Y. The company has $25,000 capital stock.

The Meadville Vise Co., Meadville, Pa., manufacturer of the Barrett horizontal cylinder boring machines and vises, has changed its name to the Barrett Machine Tool Co. James O. Barrett and Charles J. Barrett, who constituted the Meadville company, will continue in charge of the new company.

The Peacock Iron Works, Selma, Ala., is seeking another location, and may move to Chattanooga, Tenn. The company's specialty is car wheels and cars. The company wishes to triple its capacity.

Daniel Bros. have established machine shops at Tuscaloosa, Ala. The plant is well equipped with modern machinery.

The Barth Elevator Co., Milwaukee, Wis., has been incorporated with $60,000 capital, to take over the Barth Mfg. Co. Freight and passenger elevators will be manufactured.

The old Dorner Truck & Foundry Co.'s plant, Logansport, Ind., is to be reopened and employment furnished to 75 men. The Dorner Mfg. Co., capital stock $100,000, has been incorporated to manufacture car trucks, etc. The directors are: H. A. Dorner, R. D. Buckingham, Oscar Lund, B. H. Walrath and Lloyd J. Smith. Work will at once begin to put the plant in shape for operation. The defunct Dorner Truck & Foundry Co. was organized about four years ago, but through lack of funds and other difficulties was obliged to cease business.

The Herron Pump & Foundry Co., Chattanooga, Tenn., will increase its capital from $100,000 to $150,000 in order to have a larger working capital. The company recently obtained a contract to furnish the Panama Canal Commission with supplies of valves and hydrants.

Before the end of the present month about 3,000 tons of railroad material will be shipped from New York to Zanzibar, Africa. The equipment is for street railway service in that town, and a steam railroad will be built into the interior for a distance of nine or ten miles.

The Newport Foundry & Machine Co., whose plant at Newport, Ky., was recently sold to the strikers, has changed its name to the Weber Foundry Co. and purchased the foundry plant, contracts and good will of the Wessling Bros., who have operated a foundry at McLean and Sherman Aves., Cincinnati, on the Southern Railroad. The company will continue to make gray iron castings. Henry J. Weber is president.

The Schonthal Iron & Steel Co., Columbus, O., has notified the employes of its mill at Cumberland, Md., that the plant will be closed down permanently.

The contract for the compressed air power plant, to be used in driving the second pair of trolley tunnels under the Hudson River, has been awarded to the Ingersoll-Sergeant Drill Co. The order includes five duplex air compressors. Three are low pressure machines with steam cylinders 14 and 28 in. diameter, air cylinders 22¼ in. diameter and 16 in. stroke, with a maximum air pressure of 50 lb. per square in. and a capacity of 1,850 cu. ft. of free air per min. each. The other two are machines for high pressure, with steam cylinders 14 and 28 in. diameter, air cylinder 24¼ and 14¼ in. diameter and 16 in. stroke, with a maximum pressure of 125 lb. per square in. and a combined capacity of 2,000 cu. ft. of free air per min. This makes 38 Ingersoll-Sergeant Air Compressors with a total capacity of 117,234 cu. ft. of free air per min. now used in building the various tunnels under the Hudson and East rivers.

Judge Holt, of the United States District Court, has appointed Wilbur Larremore receiver in bankruptcy for the Cosmopolitan Range Co., 26 Sullivan St., New York, against which a petition was filed Feb. 21.